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ATOXYL IN THE TREATMENT OF MALARIA.

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In the native hospital of Nhatrang, I had the opportunity of studying the therapeutical action of atoxyl on seventeen different cases of malaria. The patients were Annamese and came from the gangs of workers on the railway line Phanrang-Nhatrang, now in construction. There is much severe malaria among them. During the two years employed in the construction of the earthworks the following cases occurred:

Cases treated.	1906.	1907.
In hospital	152	132
Outside hospital	6,286	974

The inequality in the figures is due to the fact that the workmen were more numerous during the first year than the second. The Annamese do not like being sent to the hospital and it is very difficult to keep them there for any length of time. Therefore our observations were difficult to pursue and in some cases were not carried out as thoroughly as we could have wished; some of them were even interrupted abruptly.

Atoxyl is enjoying a vogue in therapeutics which is almost without example. It has rapidly become the specific agent in sleeping sickness (Thomas, Laveran, Mesnil, Nicolle and Aubert, and R. Koch) and plays a prophylactic rôle of the highest importance in syphilis (Metchnikoff and Salmon.) Its action is again manifest on several forms of trypanosomiasis (Nicolle, Mesnil, Moore, Nierenstein and Todd); in acquired syphilis (Uhlenhuth, Hoffmann, Roscher, Metchnikoff, Hallopea, Lassar, etc.); in general paralysis (Marie); in the spirillosis of fowls (Uhlenhuth, Gross and Bickel); in pellagra (Babes and Vasiliu). On the other hand atoxyl has been inefficacious in tick fever (Breinl, Kinghorn and Vassal).

Arsenical preparations have been specified for some time as effective against malaria (Boudin, Mosler and Guerin), but the use of atoxyl for such a purpose does not appear to have given rise to many researches in this direction until the present time. R. Koch in Africa, has had the opportunity of studying its effects on the negroes attacked with sleeping sickness and malaria at the same time. The antiparasitic power of atoxyl was supposed to limit the action of the Trypanosoma Gambiense and only slightly to influence the evolution of Laveran's hæmatozoön.

THERAPEUTIC DOSES OF ATOXYL.

The experimental therapeutic tests have shown us the different qualities of atoxyl and the proper doses to be employed.

F. Mesnil, Nicolle, and Aubert for instance give 2.5 centigrams for every 1,000 grams of the animal's weight. Metchnikoff prevents the primary eruption of the syphilitic chancre in the monkey, by giving it 33 milligrams for every kilogram of the animal's weight. According to this investigator the prophylactic dose for a man of 60 kilograms of weight should be at the most 2 grams. Hallopeau keeps within these limits in his preventive treatment, but inoculates from 5 to 7.5 grams during a period of three weeks as a precautionary measure in syphilis. For sleeping sickness in the negro, R. Koch injects 0.50 gram of the drug every other day during two months.

Our patients here were composed exclusively of Annamese weighing on an average 35 to 40 kilograms. We used noncrystallized atoxyl "Martini Renfelde" from Berlin. The strength of the solution was 10 per cent; the injections were made as with quinine, deep into the muscles of the buttocks, except in one case (observation 7) where they were made under the skin of the abdomen. The solutions were always freshly prepared and boiled in a water bath for ten minutes before use. The maximum dose of atoxyl employed at one inoculation was 1 gram. The same solution (10 percent) was employed per os in the dose of 10 centigrams of atoxyl a day during ten days or for a longer period without interruption.

We administered the atoxyl in two different ways:

1. Alone in hypodermic injections.
2. Associated with hypodermic injections of hydrochlorate of quinine given either by injections or per os.

The results obtained are the subject of the present memoir. We will divide them into two parts: (I) Treatment by atoxyl alone; (II) treatment by atoxyl with quinine.

PART I.

TREATMENT BY ATOXYL ALONE.

We are able to report upon seven cases, of which four were of malignant, tertian malaria and three of single, tertian fever. These were numbers 2, 6, 8, 12, 15, 16, and 17.

No great weight must be attached to the observations on case number 12, as the treatment was interrupted by the abrupt departure of the subject. Three inoculations were made during six days, the two first consisted of 0.25 gram and the other of 0.50 gram. They were well supported.

On the other hand, the observations on case number 2 are complete.

The patient was a young Annamese 23 years of age and was suffering with malarial cachexia, with hypertrophy of the spleen, œdema of the extremities and pulmonary congestion. The treatment in hospital lasted eighty-five days. He was given only 1.50 grams of atoxyl in three injections during a period of nine days. All other medication was avoided. The fever remained above normal for sixteen days although there were some remissions. Therefore, the parasitic action of the drug seems *nil*, but the general state of health improved, and the spleen diminished in an appreciable manner.

Number 8 was a case of double tertian, malarial fever in a native of 22 years of age.

The first injection of atoxyl, 0.50 gram, was made during an exacerbation of the fever and when the blood showed an intense multiplication of the parasite. Three injections were made within six days in doses of 0.50 gram each. The patient was lost sight of at this period, but it was not long before he returned in a still worse condition, with advanced cachexia. The extremities were swollen and albumin was present in the urine. It was only too evident that the first injections had no effect. On his return he was given two more grams of atoxyl in four days (0.50 gram per day). An analysis of the blood left no doubt as to the failure of the specific treatment. The further increase of the young forms of the parasite continued regularly, there being at the previous examination from three to four parasites in a field and at the later examination, from ten to twelve; neither were the gametes in any way influenced by the drug. The effect on the general condition seemed favorable, but it is difficult to give a decided opinion on this point, as the patient was lost sight of again before his cure was terminated.

Number 6 was a typical case of tertian fever. Atoxyl was again employed; in nine days three injections were given consisting of 2.50 grams.

The chart of the temperature and the analysis of the blood proved that the infection followed its course without any modification whatever by the drug. The experiment was pushed as far as the resistance of the patient would permit. Sponging and antipyretics were necessary to keep the fever within bounds. The specific action compared to that of quinine was certainly nil. After some slight relapses, convalescence set in with a surprising rapidity. The patient left the hospital after a month having increased three kilograms in weight. He had received altogether 5.50 grams of atoxyl.

Case number 15 is interesting on account of the accidents caused by atoxyl. We will discuss them later. Four grams were injected in eight days. The fever showed a tendency to decline.

Another patient, number 16, was treated even more energetically; 4 grams were given in seven days; his high temperature was found to fall rapidly but a serious remission occurred. The drug was well borne, but the premature departure of the patient prevented any commentary on the future results of the treatment.

Observation number 17 was similar to observation number 6. This was also a case of tertian fever. There was no doubt again as to the failure of the specific treatment. As soon as quinine was given the temperature became reduced and pursued a normal course.

PART II.

TREATMENT BY ATOXYL AND QUININE.

A mixed treatment was tried in ten cases (1, 3, 4, 5, 7, 9, 10, 11, 13, 14) in the following manner:

1. Injections of quinine associated with injections of atoxyl.
2. Injections of quinine associated with atoxyl *per os*.

We used a solution of hydrochlorate of quinine in a dilution of 1 to 10. Number 13 was the only case in which injections of quinine were associated with injections of atoxyl.

The first nine days we gave injections of quinine, 0.50 gram each; these were immediately followed by three injections of atoxyl, 0.50 gram each, given the first, second, and sixth day. The affection was of long duration and crescents were frequently met with in the peripheral blood. The results on the whole were favorable, the patient's condition being much improved when he left the hospital.

The nine other cases concern the action of atoxyl *per os* combined with hypodermic injections of quinine.

In case number 1 quinine was injected for six days in succession. Six days later apyrexia set in. The hæmatozoa (*Laveranía malariæ*) which had disappeared, showed themselves again in the blood in considerable numbers. Atoxyl was then administered *per os*, 10 centigrams a day; there was again a febrile reaction the third day, then the temperature became normal. The spleen diminished in size and improvement in the general state of health became manifest.

The principal fact to be noted in case number 3 is the occurrence of repeated febrile attacks of malignant, tertian fever against which atoxyl *per os* was quite ineffective. Quinine was efficacious the moment it was given by injection. It was continued nevertheless at the rate of 1 gram a day for five days. It is possible to suppose that although atoxyl itself was powerless against the parasite, it prepared the way for the action of the quinine. The patient left the hospital improved.

Number 4 was a particularly tenacious case of malignant, tertian fever which had never before been treated. The spleen was enlarged extending beyond the border of the short ribs. First, a series of six injections of quinine (0.50 gram) was given during a period of ten days, then atoxyl was administered *per os* for nine days. A serious relapse ensued. A second series of six injections of quinine was given in the usual quantities. From that moment recovery seemed certain, the spleen diminished in size, and the weight of the patient increased 1 kilogram in five days. The benefits of atoxyl and quinine seemed incontestable.

Observation number 7 was made upon a similar case. From the gravity of the febrile attacks and the curve of the chart, atoxyl was soon abandoned and replaced by quinine, three injections of 1.50 grams in three days were given. Then atoxyl was again administered *per os* for fourteen consecutive days. At this time a slight relapse necessitated the employment of quinine. In consequence, atoxyl again failed as a febrifuge, but was probably not useless as a reconstituent, for the patient became convalescent and gained 2 kilograms in twenty days weighing 36 kilograms; at the end of this time moreover he was able to undertake his rough work on the railway again after remaining only one month ill in the hospital.

The cases numbered 7 and 9, who were in an advanced stage of cachexia, were certainly benefited by the combined treatment, since they were able to undertake their work again after two months in the hospital. During this time an increase of weight occurred, their general condition improved, and their spleens decreased in size. Number 7 was given atoxyl at the same time as the quinine and number 9 directly after it as the respective charts indicate.

If observation 10 seemed favorable to the routine employment of atoxyl, observation 11 shows its impotence, but I must add that number 11 was an exceptional case, rebellious against all treatment.

Observation 14 was interrupted.

ACCIDENTS DUE TO ATOXYL.

We already possess much knowledge concerning accidents which may arise from the use of atoxyl. Passing troubles, such as loss of appetite, nausea, and diarrhœa, are common to all forms of treatment with arsenic and are easily overcome. The complications which occur as a result of the localization of atoxyl in the nervous centers are more serious.

B. Waelsch relates that Bornemann observed an atrophy of the optic nerve due to hypodermic injections; it is true that the doses were large, 27 grams. R. Koch relates several cases of amaurosis among the negroes suffering with sleeping sickness, who were treated with large doses of atoxyl. A dose of 1 gram continued for some time provokes nausea, giddiness, attacks of colic, and finally amaurosis. Koch thought that this amaurosis was transitory and would disappear when all medication was eliminated; such was not the case, the patients recovered otherwise, but remained blind.

This is a danger of capital importance which should make the physician very cautious whenever atoxyl is employed as an adjuvant.

At first we only noted phenomena of little importance (cases numbered 2 and 7). In the course of treatment, number 7 had a passing diarrhœa. Number 2, who had been injected subcutaneously, seems to have felt a pain like that of a wasp's sting at the time of the injection, while the other patients found no difference between the injection of atoxyl and that of quinine. Case 2 after each dose suffered from itching all over the body, which was particularly violent about the nostrils, on the scalp, and about the pubis. Finally he had diarrhœa and a metallic taste in the mouth.

The only serious accidents were those in case number 15 who had received 4 grams of atoxyl in eight days. Less than twenty-four hours after the last injection, an erythema broke out on his face, and at the same time diarrhœa set in, with decided anorexia and nausea. From the beginning the itching was violent. The following day the whole trunk, the arms and hands, and the front of the thighs became covered with rubeoloid spots, which became confluent on the lower part of the back and there formed patches about the size of the hand. The pruritus was very intense. The eruption attained its maximum the third day; it was confluent on the chest and back, and spread out over the thighs; the face, feet, and legs were œdematous. Albumin appeared in small quantities in the urine on the third day. The spots on the fourth day were paler and the œdema of the lower limbs had diminished; on the fifth day the erythema had totally disappeared and the other symptoms had improved. Under an appropriate treatment recovery was the work of a few days.

It follows from the above that therapy with atoxyl must be kept within certain limits. As a general rule with the Annamese more than 2 grams should not be given hypodermically within a week.

There is no object in using large doses of atoxyl for malaria, as the drug is of really no value in the acute stages of the disease. The dose of 10 centigrams a day *per os* seems one that could be continued for some time, but my experience is not complete enough and is too recent for me to speak positively upon this question.

THE ACTION OF ATOXYL IN MALARIA.

Atoxyl alone, in large therapeutic doses, is incapable of stopping or modifying a febrile attack of malaria. It is not a febrifuge, nor is it even moderately antipyretic in its action.

Its direct action on the hæmatozoa of tertian and malignant, tertian fever is inappreciable, whether it is given in single large doses or is continued without interruption in small ones. It is powerless against the acute symptoms of malaria. It does not prevent relapses. In short its specific action is *nil.*

As an adjuvant to quinine on the contrary, atoxyl shows an unquestionable efficacy. We have cited numerous examples. It rapidly improves the general condition and restores strength. It is a reconstituent which is superior to the other well-known arsenical compounds. In cachectic enlargement of the spleen, where quinine itself often fails, atoxyl, combined with quinine, proves efficacious.

Malarial patients given the mixed treatment tend to increase in weight to a remarkable degree.

The red cells undergo no modification and do not increase in number. The percentage of the different leucocytes remains the same; however, the size of the large mononuclear leucocytes seemed increased after the employment of atoxyl.

CONCLUSIONS.

1. Used alone, atoxyl does not exercise a specific action in malaria.
2. Associated with quinine, it is capable of bringing about a rapid improvement in health and of hastening convalescence.
3. In cachexia and chronic forms of malaria, quinine with atoxyl appears to be more officacious than quinine alone.
4. Atoxyl in large doses is sometimes borne with difficulty and may even give rise to accidents.

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METHODS OF STUDYING THE STRUCTURE OF THE CENTRAL NERVOUS SYSTEM.[1]

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The object of teaching the anatomy of the central nervous system is to make clear to the student what is obviously complex. This can be done best by presenting a comprehensive study of the gross structural details, followed by an intricate dissection of the fiber paths with a parallel study of cross sections (gross and microscopic). Practical work with demonstrations of the general morphology of the central nervous system should precede lectures, which are mainly to present features that can not be seen, and are secondary or explanatory.

Not only should the subject be presented topographically in order that the student may familiarize himself with the position of the most important structures, but the recent works of Sherrington(8), Johnson(4), and others should be utilized. Thus, the functional significance of the structures may be emphasized. The older methods of study should not be discarded where they have proved effective, but they should be combined with recent methods and subordinated where necessary. No dissection of the association bands equals the breaking up of the cerebrum as practiced by Meynert(6). Horizontal, coronal, and sagittal sections of the brain continue to be profitable for study. Brief, descriptive outlines of the gross external morphology are valuable. Flechsig's(2) masterly contributions should be utilized with the results of degenerations to demonstrate localized areas and fiber tracts. Sabin's(7) model is the best possible means to a clear understanding of the complex medulla and midbrain regions. Embryology and comparative anatomy are indispensable(9). Accurate drawings should be made with each step as it is finished and at the end all the principal fiber tracts of the nervous system should be reconstructed by diagrams.

A clear presentation of any subject is necessary in teaching Filipinos through the medium of the English language with which the most proficient students are somewhat unfamiliar, but this is especially true of the anatomy of the central nervous system, and the more objective the presentation, the better will it be understood. The present first, second, and third year classes in the Philippine Medical School composed of Filipinos from all parts of the Archipelago have utilized successfully a scheme of study that is presented in brief below. The first portion of this scheme was employed by me when teaching "brain dissection" at the University of Michigan (1905–1907), and I am indebted to Professor J. Playfair McMurrick for the essential outline, but the details have been somewhat altered. The study of the central nervous system follows the dissection of the human body, and is the conclusion of the course in histology and embryology.

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[1] Read at the 6th Annual Meeting of the Philippine Islands Medical Association, Manila, February 11, 1909.

First dissect the spinal cord and study the gross details, then examine the brain box with the dura mater, sinuses, and emerging nerves, after which survey the brain as follows:

The *dura mater* is left in the skull because of its intimate adherence to the base:

The *arachnoid*, a fibery web between the dura and pia mater, is adherent to the pia mater for the most part, but separated from it by a distinct space, the *subarachnoid space*.

The *pia mater* is on the surface of the brain.

Behind the cerebellum is the *cerebellomedullary subarachnoid cistern*.

At the base of the brain occupying the interval between (*a*) the pons, (*b*) the temporal poles, and (*c*) the optic commissure is the *interpeduncular subarachnoid cistern* pointed like a five-rayed star by prolongation into (*a*) the tentorial fissures between the cerebrum and the cerebellum, (β) the lateral fissures (Sylvius) anterior to the temporal lobes, and (γ) the longitudinal fissure anterior to the optic commissure. The subarachnoid space is continuous with the same space around the spinal cord and also with the brain ventricles and the central canal of the cord through (*a′*) the *median aperture* of the *fourth ventricle* (Magendie), and (*b′*) the two *lateral recesses* for the choroid plexuses at the base of the temporal lobes.

Note the arrangement of the blood vessels: veins mainly in the roof; arteries at the base. The direction of blood flow is upward in each, with downward return through the sinuses.

Arteries: Three sets, namely (*a*) on the brain surface, *anterior, middle,* and *posterior cerebral;* (*b*) *median ganglionic* branches into the base of the brain and basal ganglia; (*c*) *choroid* arteries to the brain cavities.

The circle of Willis is formed by:

I. The *basilar* artery, produced by the union of the vertebrals from the subclavian. Ventral to the pons it divides into two equal branches:
  1. Posterior cerebral arteries from which are given off: *Superior cerebellar* arteries. The third nerve between (*a*) and (*b*) should be noted.

II. The internal *carotid* arteries which give off:
  1. *Posterior communicating* arteries to join the posterior cerebral.
  2. *Middle cerebral* arteries which enter the lateral fissures (Sylvius).
  3. *Anterior cerebral arteries*, the ventral continuation of the internal carotid arteries, and
  4. *Anterior communicating* connecting the two (*c*).

Next study the cranial nerves, as follows:

1. *The hypoglossal or XII* arises between the pyramid and the olive by three or four roots. How does it leave the skull? What is its distribution? Somatic motor.
2. *The accessory or XI* runs lengthwise along the medulla, receiving roots from it. It starts in the cervical cord and enters the cranium at the foramen magnum. How does it leave the skull? What is its distribution? Somatic motor.
3. The *Vagus or X.*
4. The *Glossopharyngeal or IX.*
   } Lateral to the medulla just ventral to the upper, cut end of XI. The small bunch of roots anterior belong to IX.
   How does it leave the skull? What is its distribution? Visceral sensory and motor.
5. *Acoustic or VIII.*—Dorsal to pons close to the cerebellum. A large bundle. Its exit from the brain case? What is its distribution? Somatic sensory.
6. *Facial or VII.*—Medial to VIII. Its exit from the brain case? From the skull? Its sensory root is the intermediate nerve of Wrisberg associated with VIII. Visceral sensory.
7. *Abducent or VI.*—Near the median line just behind the pons. Its exit from the skull? What is its distribution? Somatic motor.
8. *Trigeminal or V.*—Lateral to the middle of the pons, a large nerve. The smaller motor root is at times distinctly mesial to the sensory. Its exit from the skull? Its distribution? Somatic sensory.
9. *Trochlear or IV.*—Emerges from the tentorial fissure. (Its origin is from the roof of the IV ventricle, seen later.) Its exit from the skull? Its distribution? Somatic motor.
10. *Ocular motor or III.*—Mesial to the peduncles of the cerebrum, a rather large nerve. Its exit from the skull? Its distribution? Somatic motor.
11. *Optic or II.*—Three parts. (1) Nerve, (2) commissure, (3) tract between commissure and brain. Its exit from the skull? Somatic sensory.
12. *Olfactory or I.*—Not shown. Is the olfactory bulb in the preparation? Are the nerves left in the skull? Their exit from the skull? Visceral sensory.

The embryology and comparative anatomy of the brain should be given at this period.

Remove the pia and arachnoid taking with them the blood vessels, and, if necessary, the nerves.

A. On the dorsal surface of the brain note:
   I. The upper surface of the *medulla.*
   II. The posterior part of the *fourth ventricle,* seen by depressing the medulla. Note that the ventricle seems to have no roof; this is thin and has been torn away, usually in removing the brain from the skull.
   III. *The cerebellum.*—Note the color and the convolutions.
   IV. Between the cerebellum and the cerebrum is the *tentorial fissure.*
   V. *The two cerebral hemispheres.* Note the color.
      1. Between them is the *longitudinal fissure.*
      2. At the dorsal extremity of this is an opening in the pia mater which transmits the *internal cerebral veins* (Galen) and the *choroid plexuses* of the III and lateral ventricles to the straight sinus.

3. Gently separate the two hemispheres, cutting through the strands of arachnoid which prevent this, until you come to a white band.
    - (*a*) The *corpus callosum.*
    - (*b*) Note running along the median line of this the *vein of the corpus callosum.*

B. On the basal surface of the brain note:

- I. In the medulla:
    1. The *anterior median fissure:*
    2. On each side of this a longitudinal band, the *pyramid.*
    3. Lateral to this a narrow, curved band and ventrally a small, oval eminence, the *olive.*
    4. The *restiform body,* external.
- II. In the midbrain region:
    1. A narrow, transverse band of fibers over which the pyramids run, *trapezoid body.* (This is covered by the pons in the human brain).
    2. A broad, transverse band, the *pons.*
- III. In the midbrain region:
    1. Passing forward and outward from the pons, the *peduncles* of the *cerebrum.*
    2. The triangular space between, *posterior perforated substance.*
    3. Forming the anterior boundary of the posterior perforated substance—a rounded, whitish body indistinctly divided by a longitudinal fissure into 2, the *mammillary bodies.*
    4. In front of these a slit, the *infundibulum.*
- IV. In the forebrain region:
    1. *Temporal lobes.*
    2. The *lateral fissure* (Sylvius), separating them from the remainder of the brain.
    3. The lower end of the longitudinal fissure.
    4. Anteriorly, the *olfactory bulb.*
    5. Leading back from these, the *olfactory tracts.*
        - (*a*) Passing out and back to the summit of the temporal lobes, the *outer olfactory tracts.*
        - (*b*) Passing back and inward and soon lost from view by turning into the longitudinal fissure, the *inner olfactory tract.*
    6. Passing transversely from the tip of the temporal lobes to the longidinal fissure and lying underneath the optic commissure is the so-called *crus of the corpus callosum.*
    7. Between the two olfactory tracts and 6 is the *anterior perforated* substance on each side. The anterior part of each space is called the olfactory trigone in which a third or *median olfactory tract* can be seen to have its termination.

Make a median, longitudinal (sagittal) section of the brain.

- I. Note the arrangement of the white and the gray matter in the median section of the cerebellum.
- II. Note the *anterior velum* forming the roof of the anterior part of the IV ventricle and lying below the cerebellum.
- III. Note the depression on the under surface of the cerebrum where the *superior* (*anterior*) velum is attached and where the *inferior* (*posterior*) *velum* starts.

IV. Separating the cerebellum from the cerebrum, note in bending backwards and outwards, the *brachium conjunctivum* of the cerebellum.
  1. The anterior velum attached laterally to these.
  2. The *IV. nerve* leaving the brain through the anterior velum and passing out across the peduncles.

V. At the side, immediately in front of the V. nerve, the *brachium of the pons* continuous below with the transverse pons fibers.

Now cut through the brachium of the pons and the brachium conjunctivum, enter the substance of the cerebellum and continuing to cut backwards remove the cerebellum.

I. Note the cut surface of the brachium conjunctivum, the brachium of the pons, and the restiform bodies.

II. Make a cut through the cerebellum parallel to the median cut surface, passing through the brachia and note:
  1. The arrangement of the white matter.
  2. In the white matter a patch of grayish matter the *dentate nucleus*.

In the medulla observe:

I. The *posterior funiculi* of the cord.

II. These are continuous above with a spindle-shaped enlargement bending outwards, the *clava*.

III. The *restiform body*.

IV. The *fourth ventricle*.

In the midbrain region:

I. The *aqueduct of the cerebrum* (Sylvius).

II. The *superior hillocks of the quadrigeminal bodies*.

On the outer surface of the midbrain note:

III. A band of white fibers passing forward and downward from the inferior hillocks, the *inferior brachium*.

IV. This (III) ends anteriorly as a large swelling, the medial *geniculate body*.

V. Note the fibers of the optic tract covering the anterior portion of the side of the midbrain and concealing the superior *brachium and the laterial geniculate body*.

VI. In front of the optic tract is the posterior extremity (pulvinar) of the *optic thalamus*.

VII. Anteriorly the front part of the entrance to the aqueduct of the cerebrum, the roof of the III ventricle, bends somewhat ventrally and then returns upon itself. At the lowest point of the bend is the *posterior commissure*.

VIII. The upward bend of the roof in front of the posterior commissure is the posterior part of the *habenula*, a round, or elongated body.

IX. At the summit of the habenula is the *pineal body* or *epiphysis*.

X. Passing from behind forward over the epiphysis is a bunch of vessels which join the roof of the III ventricle in front of the epiphysis and pass forward in it. This is the choroid plexus of the III ventricle and the portion of the roof of the ventricle in which it lies is the *velum interpositum*.

XI. Anteriorly, the velum interpositum is attached to the *lamina terminalis.* This is relatively thick above, but becomes thinner below and ends by becoming attached below to the front edge of the optic commissure. The ventricle forms a slight prolongation forward above the optic commissure which is the *optic recess.*

1. Note, entering the upper part of the lamina terminalis, the *pillars of the fornix.*
2. Just behind the upper part of the lamina terminalis and bounded above by the velum interpositum is the *interventricular foramen of Munro.*
3. In the lamina terminalis, a little below the level of the foramen of Munro, is the *anterior commissure.*

XII. The floor of the III ventricle is formed of, in front:

1. The *optic commissure.*
2. Behind, the *tuber cinereum* from which the infundibulum projects downward.
3. From behind the tuber cinereum and just in front of the mammillary body, the floor ascends obliquely to join the floor or the *aqueduct of the cerebrum.*

XIII. In the lateral walls of the III ventricle are the large *optic thalami.*

1. Connecting these and passing across the middle of the ventricle is the *intermediate mass.*

On the mesial surface of the forebrain are seen:

I. The *corpus callosum.* Note:

1. The posterior end slightly rolled under, the *splenium.*
2. Anterior to this a narrow, constricted portion, the *Isthmus.* (1).
3. The *trunk* or *body* forming the main part of the callosum.
4. The prominent anterior end, the *knee.*
5. A portion bending back from the knee to join the lamina terminalis, the *beak.*

II. The *fornix.*

1. The crura come from the floor of the lateral ventricles and bend down in the lamina terminalis.
2. The greater portion of that seen is the *body* of the fornix composed of fibers extending between the two crura.
3. Note that the body of the fornix behind fuses with the splenium of the corpus callosum.

III. Across the triangular area inclosed by the callosum and the *fornix* stretches a thin membrane—the *transparent septum*—which separates the two lateral ventricles.

1. The septum is really double, *i. e.,* consists of 2 parallel membranes. The space between the two is termed the *V. ventricle.*

In one half-brain, cut away the roof down to and parallel with the upper surface of the corpus callosum. In doing this you will probably have removed a portion of the lateral ventricle. Remove the remainder of the roof of the ventricle cutting at first forward and taking care not to cut away the corpus callosum. You will thus expose the body of the ventricle and an anterior prolongation of it which extends forward and downward, the *anterior horn.*

Now cutting backward you will find that the ventricle soon turns and extends outward and then downward and finally forward to the tip of the temporal lobe. This is the *inferior horn*. A *posterior horn* arises from the inferior horn and extends into the occipital lobe.

In the floor of the anterior horn, note on the outer side:

1. A large, rounded eminence tapering off behind. This is the intraventricular part of the corpus striatum, *caudate nucleus*.

Internal to this:

2. The *choroid plexus* of the lateral ventricle which enters by way of the foramen of Munro and extends to the tip of the inferior horn.

3. Internal to and behind this a rounded eminence, the hippocampus. Snip off a piece of the surface of this and note that the main mass is gray matter, the white being a thin layer covering it. Note differences in the brain ventricles.

Make vertical, transverse sections (coronal) of one half-brain: 1. Just behind the olfactory bulb. 2. Just in front of the knee of the corpus callosum. 3. Through the middle of the infundibulum. 4. Through the corpora albicantia. 5. Through the superficial origin of the III nerve.

Study these in connection with similar microscopic sections at the same time that the dissection of this basal region is made. Observe especially the *optic thalamus*, *caudate* and *lentiform nuclei*, with the internal and external capsule and *claustrum* forming the *corpus striatum*.

At this point the dissection of the brain by Johnston's method (3) may profitably be undertaken, using the outline he gives in so far as the somatic and visceral divisions are concerned. The greatest objection to Johnston's outline is that he overemphasizes the olfactory apparatus, devoting two pages to this and only seven pages to the whole remaining structure of the central nervous system.

The work previously outlined has been most successfully carried through by giving one hour periods each day for two weeks, but it may be condensed into longer periods each day for a shorter time. Additional work, such as the making of models from macerated scrap paper and flour paste by the method of Mendoza, Ramirez, and Valencia (5), may be done after having finished the brain dissection according to Johnston's outline.

Students in the Philippine Medical School who are well advanced may undertake elective work of this kind or they may work on original problems suggested by previous studies. During the intersessional vacation the majority of them elect some special topic for investigation, and devote six weeks to an occupation that is particularly refreshing and zestful.

The surface morphology of the brain is studied as follows (this, if expedient, should precede Johnston's method of brain dissection):

Take a human brain and study the lobes, fissures and convolutions.

1. The *lateral fissure* (Sylvius).
2. The *central fissure of Rolando*.
3. On the mesial surface the *occipito-parietal fissure*.

These three fissures divide the brain into lobes.

1. Above the lateral fissure and in front of that of Rolando, the *frontal lobes.*

2. Above the lateral fissure and between that of Rolando and a line prolonging the occipito-parietal fissure on the outer surface of the brain, the *parietal lobes.*

3. Behind this line and the occipito-parietal fissure, the *occipital lobes.*

4. Below the lateral fissure, the *temporal lobes.*

(These lobes are merely topographical divisions. They have no special physiologic or morphologic significance.)

In the frontal lobe, on the outer surface note:

1. Parallel to the fissure of Rolando, the *precentral sulcus* usually divided by a small convolution into two parts.

2. The convolution between this and the fissure of Rolando is the ascending frontal or *precentral convolution.*

3 and 4. The *superior and inferior frontal sulci* extend tangentially forward from the precentral sulcus. They are somewhat irregular in their course. These divide the anterior part of the frontal lobe into:

5, 6, and 7. The *superior, middle, and inferior or 1st, 2d, and 3d frontal convolutions.*

8 and 9. Two arms pass upward from near the beginning of the lateral fissure; these are the *ascending and anterior horizontal limbs of the lateral fissure* forming the three opercula 10, 11, and 12, *fronto-parietal, frontal, and orbital.*

Elevate the opercula and examine the long and short convolutions of the island and the circular sulcus of Reil.

On the inner surface of the frontal lobe:

1. The *sulcus of the corpus callosum* is immediately above the corpus callosum.

2. Above this the *fornicate convolution.*

3. Above this the *sulcus of the cingulum.*

4. Above this the *marginal convolution.*

Note that behind, the sulcus of the cingulum bends upward to meet the upper edge of the brain, and that the upper end of the fissure of Rolando is 1 to 2 centimeters in front of the point where the sulcus of the cingulum reaches the edge.

5. Note a fissure coming down from the edge of the brain about 3 centimeters or more in front of the upturned portion of the sulcus of the cingulum. This cuts off the hinder portion of the marginal gyrus, known as the *paracentral lobule.*

The sulci and convolutions on the orbital surface of the frontal lobe form an H with the gyrus rectus mesial to it.

On the outer surface of the paracentral lobule:

1. The *postcentral sulcus* is parallel with the fissure of Rolando.

2. Between Rolando and the postcentral sulcus is the *ascending parietal or postcentral convolution.*

3. Running backward horizontally from the postcentral sulcus is the *interparietal sulcus.*

4. Below this, and ascending round the posterior end of the lateral fissure is the *supra-marginal convolution.*

5. Below 3 and behind 4 and arching around the posterior end of the first temporal sulcus (*i. e.*, the first sulcus below the lateral fissure) is the *angular convolution.*

On the inner surface of the parietal lobe:

1. A quadrangular area between the upturned portion of the sulcus of the cingulum and the parieto-occipital fissure, the *quadrate lobe* or *precuneus.*

On the inner surface of the occipital lobe:

1. The *calcarine fissure* running from behind forward, joining the lower end of the occipito-parietal and then being continued forward on the under surface of the temporal lobe.

2. The triangular area between the occipito-parietal and calcarine fissures, the *cuneus.*

On the temporal lobe:

Beginning above on the outer surface and counting downward there are five sulci and six convolutions. The first three are called *superior, middle, and inferior.* The inferior convolution always forms the lower edge of the temporal lobe.

The fourth sulcus sometimes produces a small elevation on the inner surface of the brain, *i. e.*, in the floor of the lateral horn, termed the *collateral eminence,* hence the sulcus is called the *collateral fissure.*

The fifth convolution is the hippocampus. The fifth sulcus produces the hippocampus in the floor of the ventricle, hence it is called the *hippocampal sulcus.*

The sixth convolution is termed the *dentate fascia.*

The intimate structure of the brain may be studied after having examined its surface. By parboiling a fresh brain, the gray and the white substance may be separated, the gray cortex peeling off, leaving the white medullary portion intact. In this way the relative thickness of the cortex at any point may be determined, and the method may be useful in calculating the relative amounts of gray and white substance.

Meynert(6) says: "The structure of the cerebral cortex, like that of a crystal, can be studied best from its cleavage-surface." Brains that have been preserved in formalin for some time are used for the purpose of studying the cleavage-surface. When such brains are divided by a sagittal cut into two hemispheres, one of the latter may be torn asunder at the central sulcus of Rolando, and the break thus made passes through the isthmus of the corpus callosum(1).

Examination of the broken surface reveals sections of long and short *fibræ propriæ* which connect contiguous and adjacent convolutions, the *decursus* of the *cerebral fibers* which forms the *radiation* of the *corpus callosum and striatum,* and also the *corona radiata* and the broken ends of the *arcuate fibers* of the *cerebrum* which connect the frontal lobe with other parts of the brain. However, all of these structures may be seen best, by unrolling the cortex of the remaining hemisphere. By rolling out the marginal convolution from above and the fornicate convolution from below, the *cingulum* lies revealed and it may be traced anteriorly around the knee of the corpus callosum into the subcallosal convolution, and posteriorly around the splenium into the convolution and hook of the hippocampus, connecting intermediate parts of the cortex.

The *inferior longitudinal fasciculus* may be uncovered between the temporal and occipital lobes. The *optic radiation* and the *internal basal fasciculus* (Burdach) may be seen in the occipital lobe beneath the calcarine fissure.

Next, the convex cerebral surface is to be unfolded.

Starting the removal of the opercula, and of the island and convolutions of Reil, the *lentiform nucleus* is exposed with the corona radiata emanating from it. The *uncinate fasciculus* appears and connects the frontal pole and orbital convolutions with the anterior portion of the temporal lobe. Working outward into the four lobes of the brain by breaking away the cortex, the *superior longitudinal fasciculus* is uncovered and its three terminal bundles in the frontal, occipital, and temporal lobes may be seen. With special care the *anterior commissure* of the *cerebrum* with its radiating connections to the cerebral lobes may be shown, especially the temporo-occipital radiations, and at the same time the *amygdaloid nucleus* is uncovered, inferior and lateral to the basal ganglia, and the *occipito-frontal radiation* may be seen. It is of interest to note that 4 of the 5 well established arcuate fiber paths of the cerebrum connect the frontal lobe with other parts of the brain. See plates I–V.

The above outline of study is valuable because it combines approved old methods with promising new ones.

The gross morphology is described clearly and concisely, leading up naturally to the more difficult dissection and sectioning methods. The student moves along swiftly from the simple to the complex, beginning with the spinal cord and terminating with the breaking up of the cerebrum. The study begins with the analysis of the gross morphology, then goes to the synthesis of the somatic and visceral systems, to end by the analysis of the intricate mechanism of the cerebrum, having a simple introduction and conclusion, but a complex body to the work. The time given to the course is 120 hours, 6 mornings each week for 4 weeks, after the preliminary, 1 hour each morning for two weeks.

It is to be hoped that others will freely criticize and suggest regarding the above plan of study, for only by tearing down and rebuilding can perfection be attained in the art and the science of teaching, and thus we may hope to move forward.

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ILLUSTRATIONS.

[Cleavage method of Meynert. Plates I, II, and V are the same hemisphere. Plates III and IV are from the opposite hemisphere of the same brain, that of a normal, male Filipino.]

PLATE I.

FIG. 1. Association fibers. A, Part of the superior longitudinal fasciculus (occipital-frontal band); B, cingulum; C, fibers from the frontal lobe to the cingulum; D, cingulum.

2. Association fibers. A, Cingulum; B, inferior longitudinal fasciculus; C, a band of fibers from the cingulum to the temporal pole; D, hippocampus; E, fibers from the mesial frontal convolutions to the cingulum.

PLATE II.

FIG. I. Association fibers. A, Fibers of the corpus callosum; B, choroid plexus under which lie the fornix and fimbria; C, part of the temporal pontile path (Türk's bundle); D, fibers from C, E, and F to temporal and occipital lobes; E, anterior commissure; F, genu of corpus callosum.

2. Association fibers. Corona radiata. A, Frontal pontile path (Arnold's bundle); B, uncinate fasciculus; C, brain stem cut off; D, inferior longitudinal fasciculus; E, part of optic striation [occipito-mesencephalic path (Flechsig's secondary optic radiation)].

PLATE III.

FIG. 1. Association fibers. A, Central sulcus of Rolando; B, Short fibræ propriæ; C, Corona radiata and occipito-frontal fasciculus; D, Uncinate gyrus; E, Same as C, dorsal part; F, Superior longitudinal fasciculus and temporal pontile path; G, Superior longitudinal fasciculus; H, Long fibræ propriæ.

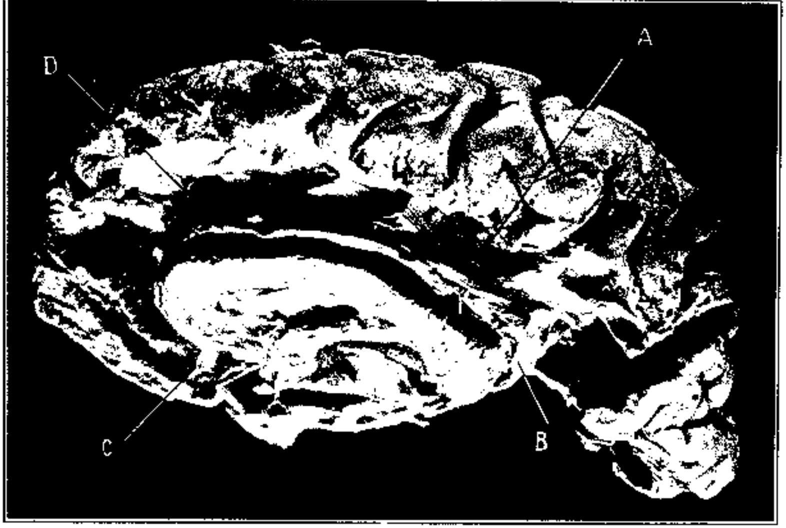


Fig. 1.

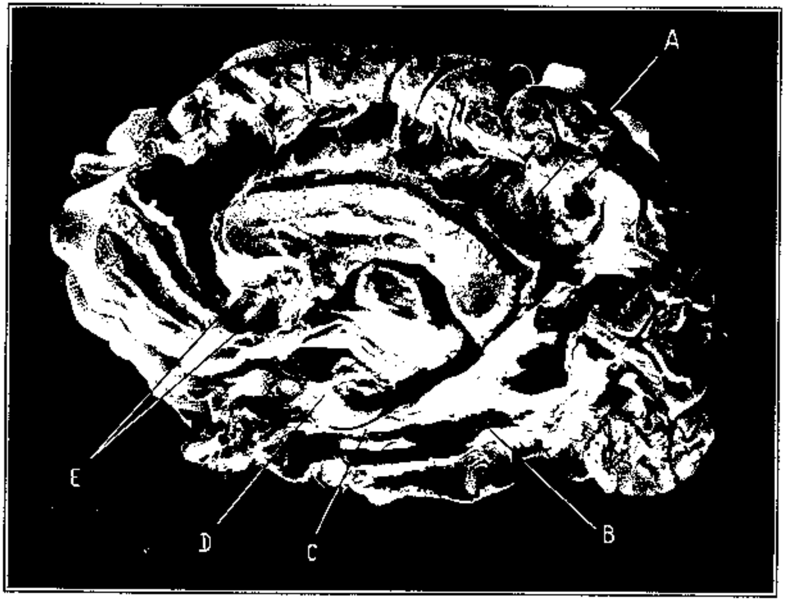


Fig. 2.

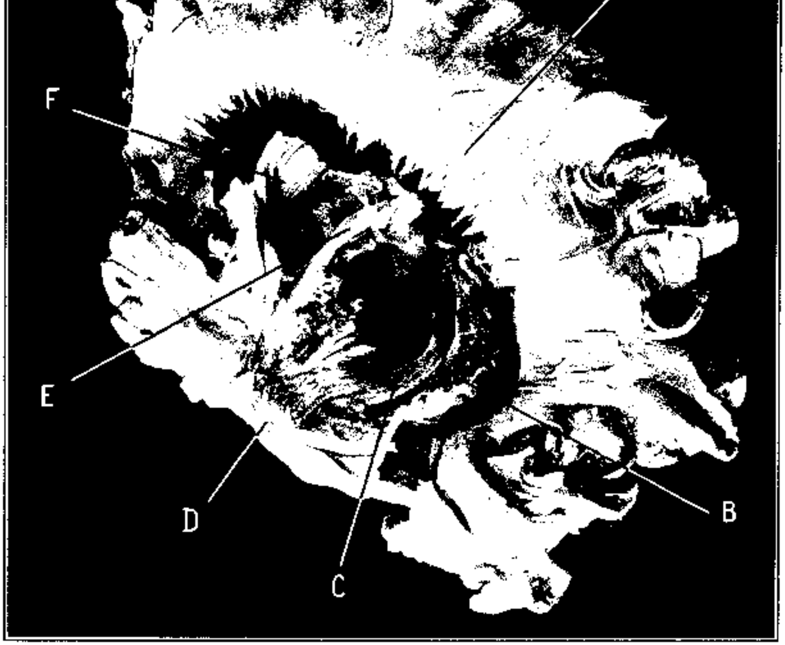
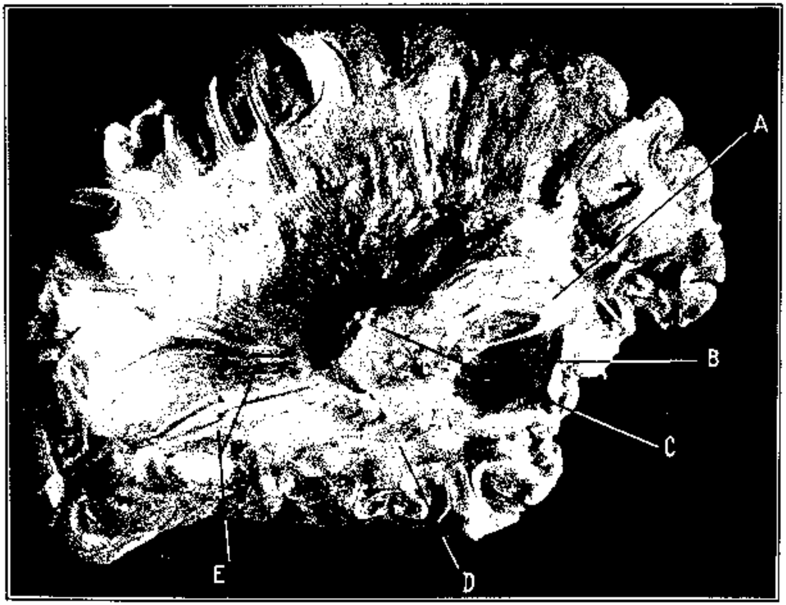


Fig. 3.



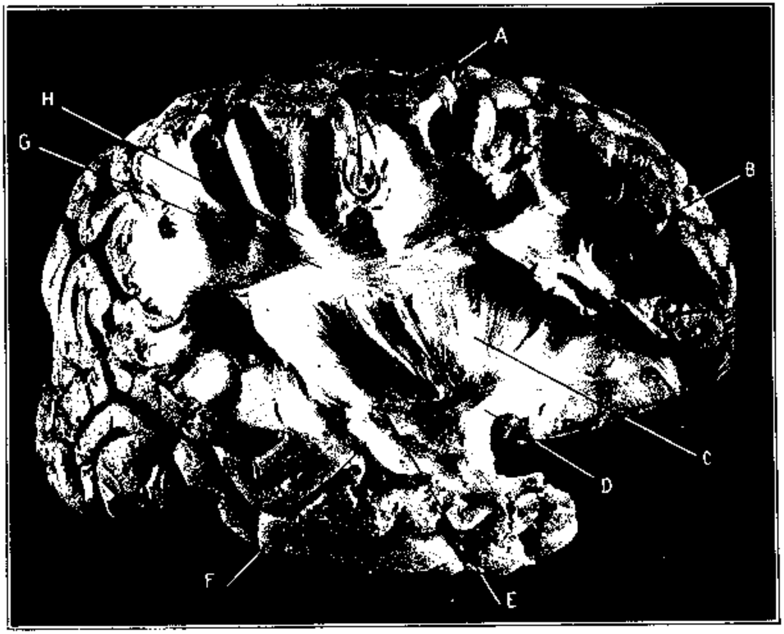


PLATE III.

DENGUE IN INDO-CHINA: EPIDEMIC ON BOARD THE "MANCHE."[1]

By J. J. Vassal and A. Brochet.
(From the Pasteur Institute, Nhatrang, Annam.)

An epidemic prevailed in May, June, and July, 1907, on the advice-transport *La Manche* of the French navy, which was off the coast of Indo-China doing hydrographic work. There were 108 Europeans on board; 94 were affected and 2 died. This epidemic was one of those which are described in Indo-China under the name of dengue, but it seemed to us that it was distinguished from the classic dengue by some peculiarities.

One of us was surgeon on board the *Manche* and therefore was able to follow the epidemic closely and to note all the features and symptoms as they appeared, including those on himself. Together we witnessed the principal phases of the malady which took place during our sojourn in the waters of Nhatrang.

Circumstances did not permit us to make an experimental investigation of the disease, but our bacteriologic verifications and our blood analyses will not be useless for the discussion of the diagnosis and for further researches which we hope to pursue on dengue.

In the following paper these researches are divided in the following manner:

(1) History of the epidemic on the *Manche* and similar forms of dengue in Indo-China; (2) etiology; (3) immunity; (4) symptomatology; (5) diagnosis; (6) treatment; (7) conclusion.

HISTORY.

The facts in regard to the epidemic on the *Manche* will first be given, then those which have been observed previously on the same boat, and finally the forms of dengue of Indo-China, about which local archives and different publications might be able to furnish us with details, will be discussed.

The *Manche* is a wooden vessel of 1,625 tons, formerly employed in cruises in the regions of Iceland and Newfoundland. She came into China Sea for the first time in November, 1905, on a hydrographic mission; passed the year 1906 in Tonkin in the Bay of Halong, and came to the Cape Saint Jacques in Cochin-China in January, 1907.

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[1] Read by Abstract at the 5th Annual Meeting of the Philippine Islands Medical Association, February 29, 1908.

The first case of dengue broke out on board the vessel while she was stationed at Saigon, from May 14 to May 31, 1907. The patient, a sailor, was nursed on board at Saigon from the 21st to the 28th of May.

The *Manche* went directly from Saigon to Camranh. There were two more cases on the 5th of June, on the 6th another, on the 7th two, and on the 8th two more. In short, nearly everyone on the boat caught the fever. On June 20, there were 32 patients ill at the same time. The entries into the hospital succeeded one another as follows:

Date.	Number of patients.	Date.	Number of patients.
May 21	[a]1	June 18	4
June 5	[b]3	June 19	6
June 6	1	June 20	14
June 7	2	June 21	7
June 8	4	June 22	8
June 9	4	June 23	7
June 10	2	June 24	4
June 11	4	June 25	3
June 12	4	June 26	3
June 13	1	June 27	0
June 14	1	June 28	2
June 15	3	June 29	1
June 16	1	Total	94
June 17	[c]4		

[a] At Saigon. [b] At Camranh. [c] At Nhatrang.

The crew of the *Manche* on June 1 consisted of 140 men, of whom 108 were Europeans and 32 natives of Annam. The following figures show the proportion in which they were attacked:

	Europeans.		Natives.	
	Number.	Patients.	Number.	Patients.
Officers	14	10		
Petty officers	10	10		
Sailors	84	74	23	0
Servants			9	0
Total	108	94	32	0

The European crew with the exception of 6 men had arrived from France in April, 1907. The sailors were for the most part young men between 20 and 23 years of age, never before having been in the Tropics. Ten officers had been in service on the *Manche* since the second half of 1906; the other 4 since January, 1907. Nearly all the Annamese had been on board at least a year before the Europeans came.

The *Manche* only remained about two weeks at Camranh; she then set sail for Nhatrang. The first death occurred on the 17th of June. The patient was an officer habitually in good health and of a strong constitution. The boat was put in quarantine and isolated in a bay off the Island of Trê. If the number of entries on the sick list are noticed it becomes evident that the maximum was attained on June 20, with 14 entries, then the number diminished progressively till June 27; but on June 23, there was a second fatal case. This man, of robust constitution, died on the sixth day of his illness from a cardiac complication which was quite unforeseen.

On July 25, the *Manche* went to the *lazaretto* of the Nha-Bê in Cochin-China. The men were sent ashore and were distributed in isolated pavilions, while the boat was disinfected by means of Clayton gas.

The epidemic was completely at an end on June 29. Some convalescent sailors were sent afterwards to the Saigon Hospital. There was no contagion either in this town or off the coast of Annam, where communication with Europeans and natives had been held unceasingly until the quarantine was declared.

The disease spread in so peculiar a manner that it is worth while to call attention to this phase of the question. The ship's reservoir of water is situated in the hold at the rear, and opens just under the midshipmen's and officers' quarters, as the plan shows. The epidemic began particularly at the rear of the boat and the man in charge of the reservoir was the first victim. The midshipmen and the other officers then became sick, in fact, the first focus of the disease was formed there. The commander, whose appartments were large and airy and also in that part of the ship, caught the disease toward the end of the epidemic.

The quarters of the sailors situated in the bow became infected a very short time after those of the officers. The mechanics were also attacked "*en masse*" and nearly all on the same day.

Mosquitoes and flies were very numerous on board during the whole period during which the epidemic continued.

PREVIOUS EPIDEMIC OF DENGUE ON THE "MANCHE."

The epidemic of 1907 was not the first which had occurred on board the *Manche*. Dengue fever had already made its appearance during the previous year when she was lying at anchor near Hongay in Tonkin.

The epidemic lasted two months, from July 21 to September 15, during which time 114 out of 127 Europeans were affected and not a single Annamese out of 30. The disease extended by little groups, the entries into the hospital succeeded each other regularly, from 2 to 7 a day. The type of fever in which two attacks were present was clearly observed in 85 cases, 5 cases were different from the classic type and the others only showed one paroxysm.

We will only enumerate the principal symptoms, reserving the discussion until later. Sudden attack, headache, rachialgia, and pains in the muscles were constantly noted. The initial eruption seemed simply a congestive state of the face; a final eruption which was more emphasized, showed itself in half the cases; it had in general a furfuraceous aspect with ulterior desquamation. A tendency to syncope was noted in some of the patients. There was anorexia and nausea as well as great constipation. The complications consisted only of boils. The illness lasted from five to six days. Sometimes the convalescence was long.

The report mentions the presence of a great number of mosquitoes (*Culicidæ* exclusively) during the epidemic. The boat had been in the Baie d'Halong since December, 1905; the six preceding months she had been anchored off Hongay and Haiphong. An epidemic of dengue prevailed simultaneously among the sailors of the "defense mobile" of Hongay. The colonial troops in barracks ashore do not appear to have been attacked.

EPIDEMICS OF DENGUE IN INDO-CHINA.

There is no doubt that dengue has existed for a long time in Indo-China. It rarely manifests itself in the form of a generalized epidemic, as in 1866 (d'Ormay) and in 1895–6 (Nogué). On the other hand, it gives rise to local epidemics which are in general restricted to the coast, Saigon and the Baie d'Halong constituting the principal areas. The epidemics attract little attention and often very little importance is attached to them.

Sporadic cases of dengue do not appear to be rare at Saigon, on boats as well as on shore. Such cases have been observed at certain epochs and in small groups. New arrivals who pay their tribute to the disease often apply the vague term of acclimatization to it.

The epidemics of 1895–6 have been described by Nogué. We will first discuss a recent epidemic on the *Kersaint* which Dr. Cazamian, of the French Navy, has described comparable to that on the *Manche*. This boat coming from Shanghai and Tonkin, anchored off Saigon on July 7, 1905. The first case of dengue appeared on July 11, 115 men out of 150 were affected and from 1 to 6 entered the hospital per day. The epidemic came to an end at the beginning of September.

There is no reference in this instance to the susceptibility of the Annamese.

The author, striving to reconcile dengue with inflenza, is tempted to accord an important rôle to secondary phenomena, but in spite of this, he traces such a complete picture of the epidemic that no doubt on the subject can remain. The temperature charts are very characteristic. The pains in the muscles, rachialgia, and headaches were not absent. The initial rash was longer and more distinct. The complications were not without gravity, since Cazamian noted albuminuria twice, and cardiac symptoms three times, which he connects with angina pectoris.

There were many flies and mosquitoes on the *Kersaint* during the epidemic.

It is stated that in May, 1904 or 1905, dengue broke out in Saigon, especially severely on the boats of the "defense mobile." We have not been able to procure the documents relative to this epidemic, but we know that three patients succumbed very quickly.

The epidemics of 1895 and 1896 raged principally at Saigon. According to Nogué, who has described them, they spread thence over all Indo-China. The *Loire*, the *Pourvoyens*, and the *Baionette*, war ships of the navy, and the mail boats of the "Messageries Maritimes" which were anchored in the Saigon River, were affected. The *Adour* of the French navy was at that time visited by dengue in Tonkin. The epidemic prevailed among the civil as well as the military population of Saigon. The writer does not give us the figures, but it seems that it extended over a considerable part of the town. He has published nine observations in detail, those of 5 sailors, 3 soldiers of the "infanterie de marine," and 1 civilian. Four cases were fatal. The post-mortem examinations were only partially made in 2 cases, but completely in 2 other. Among the most characteristic symptoms must be noted a high fever during five to six days with two paroxysms. There were also cephalgia periorbital pains, rachialgia, muscular and articular pains, a coated tongue, and constipation. The recovery was rapid. Pulmonary complications were not rare. Nogué found them in the post-mortem examinations; these were the only lesions which were mentioned. However, twice it seemed he found a slight inflammation of the meninges.

There is no doubt that Nogué describes true dengue. His examinations of blood were always negative and quinine had no effect. The epidemic broke out in the Saigon River and chiefly affected those people recently arrived from France. Seven out of 8 officers of the *Pourvoyens*, who had landed a week before, contracted the disease and entered the hospital on the same day. Nogué thinks that the dengue is endemic in Saigon; he connects these epidemics of 1895–6 with those of 1866, described by M. d'Armay, the head of the medical service in Cochin-China. It is not possible to find out from the memoir of Nogué, if the Annamese really had the dengue. At any rate he does not mention any cases among natives in Saigon or on the warships, but the administrator's reports speak at the same time of a disease in the interior, which was endemic, but which does not seem to be dengue.

ETIOLOGY.

The majority of writers on dengue have remarked for some time that it is propagated only in countries where mosquitoes abound.

Graham, who studied an epidemic in Beyrouth in 1901, was able to specify the rôle of mosquitoes in the dissemination of the infection.

Ashburn and Craig, in the Philippines, lately have given decisive arguments. They have shown that the blood contains the infectious germ, and that intravenous inoculation of the blood of a patient into a healthy man reproduces the illness after an incubation period of from two and one-half to seven days. They have even succeeded in transmitting dengue fever by mosquito bites (*Culex fatigans* Wied.). The epidemiologic facts favorable to the transmission of the disease by mosquitoes abound throughout the memoir.

E. R. Stitt also writing of the Philippines said that an epidemic affected all the patients of the Cavite Hospital, full of mosquitoes, while it did not spread in the Cañacao Hospital near by where there were no mosquitoes. The *Baltimore* sent part of its crew to Cavite; 20 out of 24 men caught the disease, while there was not a single case on board.

Our own observations argue in the same sense. During all the epidemics in Indo-China, the abundance of mosquitoes has been commented upon.

The prevalence of dengue at certain seasons at Saigon is very noticeable. The epidemic of the *Kersaint* began on the 11th, that of the *Manche* on the 21st of May. This is also the hottest and most unhealthful month of the year, besides being the one in which there are the most mosquitoes. The epidemic of 1895 and 1896 raged in April, May, and June (Nogué).

In 1907, the *Manche,* while anchored in the River of Saigon, became infested with mosquitoes and the officers could not succeed in ridding her of them. On the contrary, the mosquitoes found many collections of water and particularly the bilge water for breeding purposes. The men not using mosquito-nets were unable to sleep at night, and some of them, through continual scratching, became covered with boils. In June the numbers of mosquitoes increased. They were exclusively *Culicidæ* among which *Culex fatigans* Wied. predominated. Is it not significant that the first case which appeared, was in the sailor who was in charge of the bilge water and that the epidemic spread first to the persons nearest the reservoir? The *Manche,* being a wooden vessel, enjoyed a moderately even temperature and did not suffer from the abrupt changes which sometimes are so disturbing on iron ships. However, conditions favorable to man are also favorable to the mosquito. This boat, constructed for the cold regions of the north, was not adapted to a tropical climate. For instance, the deck was surrounded by high ports which hid the sea from view and prevented a thorough ventilation. Conditions on this vessel seem favorable for the development of dengue, since it is the second time in two years that this disease has visited it. The origin of the actual epidemic was probably in Saigon.

The other etiologic circumstances are of little importance. In June, the meteorological phenomena were normal. The barometer remained between 755 and 760 millimeters; the thermometer oscillated between 25° and 31°.6, giving an average of 28°.5 C. The hygrometric readings were high during the whole time of the epidemic. In spite of the numerous showers and frequent storms, the atmosphere was continually heavy. Life on board ship is favorable to the spread of any epidemic, but particularly to those disseminated by insects. To sum up, the rôle played by mosquitoes on the *Manche* in connection with this epidemic appeared to be of considerable importance. It is in fact the only important etiologic factor to be considered.

IMMUNITY.

"Dengue prevails indiscriminately in spite of age, sex, or race," says de Brun. We were, therefore, astonished to observe that not a single Annamese servant or sailor developed the disease. They had also shown a marked immunity during the epidemic of 1906. These natives were quite as much exposed as the Europeans and their diet was the same.

There are no differences between the naval regulations for Annamese and European sailors.

In short, 12.96 per cent of the Europeans escaped infection in 1907 and 100 per cent of the Annamese; in 1906 the Annamese again escaped infection while but 10.3 per cent of the Europeans were not attacked.

The natives of the *Manche* were questioned one by one with the greatest care; they declared that they did not remember ever having had, at any time, a like disease either on board or at home. If these declarations are worth anything, it must be admitted that the Annamese have not the same susceptibility as the French, or else that dengue is a disease so common in the country that repeated light attacks have protected them. It is this latter hypothesis that has been adopted in order to explain the immunity of negroes to yellow fever.

It is also interesting to consider the reasons why some of the Europeans escaped the epidemic of 1907. Their number was so small that an individual inquiry was possible. Those which escaped were 4 officers and 10 sailors.

Inquiry developed the fact that two out of the four officers had already had dengue on the same boat in 1905. As to the other two, they had previously taken part in a hydrographic mission off the coast of Madagascar, where epidemics of dengue are by no means rare. (See Vincent.) Their immunity was probably gained while at that station. As to the sailors who escaped dengue in 1907, three had served at Madagascar, one in the Senegal and in China, one in Guiana, and one at Saigon. The last two had already contracted dengue, one on the *Manche* in 1906, and the other on the *Kersaint*.

The susceptibility of the French in comparison with that of the Annamese has been amply demonstrated by the above considerations. All the young French sailors (100 per cent), the crew being almost entirely composed of these, were affected; we further observed that in four different instances a previous attack had given immunity for from one to two years. The immunity of the other cases seems to depend somewhat upon former visits to dengue infected countries, where attacks have either passed unrecognized. been taken for malaria.

SYMPTOMATOLOGY.

The disease begins, in general, very abruptly, either in the morning on wakening, or in the course of the day, during work. The patient feels a violent headache in the region of the forehead and around the eye sockets, sometimes he is so dazed that he scarcely can stand upright. The fever rises almost immediately. Sometimes it mounts at once to 39°.5 or 40° or more, sometimes it does not at first exceed 38°.5, but rapidly increases to 40°. In some instances the attack is less sudden, the patient only coming into the hospital in the afternoon, having felt ill since the morning, but his condition soon becomes worse. Appetite fails, the tongue becomes coated, in some cases nausea is present. We never noted diarrhœa or constipation in this first period.

Cephalalgia is very characteristic and plainly localized. There is no photophobia, but the movements of the eyes are painful and a feeling of pressure on them may be experienced. The patient is unable either to look up or to one side on account of the pain. The pain in the forehead continues without exacerbations; it diminishes rapidly.

After the second day of the disease, the patient complains only of a slight headache; the ocular and periorbital pains persist for several days. In general the fever appears suddenly, but rarely is it accompanied with a chill. The skin is hot and dry, there is at times excessive perspiration. The pulse does not always increase in rôle in conformity with the temperature; it is about 100 for 40°. In the case of one patient the pulse was at 100 only when the temperature reached 42°.

None of our cases had rachialgia or severe muscular pains. They complained only of stiffness in the back and limbs. There was no arthralgia; they were all able to stand upright and to walk. No eruption appeared either on the skin or on the mucosa. Later, the fever abated and the pains in the limbs and head diminished. The fever is the constant and important symptom.

We have collected during this epidemic 85 cases which may be divided into the following three categories:

(1) Attacks with one paroxysm.

(2) Attacks with two paroxysms.

(3) Unusual and attenuated attacks.

The fever in the first category reaches its maximum in about 24 hours and falls in five or six days by lysis, more rarely the descent takes from two to six days. The following are examples:

Case No. 18, high temperature for 2 days.
Case No. 71, high temperature for 3 days.
Case No. 67, high temperature for 4 days.
Case No. 16, high temperature for 5 days.
Case No. 14, high temperature for 6 days.

The fever in the second category may reach its maximum in twenty-four hours, or more rarely not until two days have passed, it then falls one or more degrees, rises again on the sixth day and ends on the sixth or seventh. This is illustrated in the charts of cases 7, 9, 10, and 41.

The chart of spirillum fever does not resemble that of dengue; indeed there could be no confusion between the two except in the case of spirillum fever with two paroxysms, but in the latter the ascent takes longer and stays at a high level, and the relapse is complete and lasts for several days.

The third category includes 5 attenuated fevers, in which the temperature did not rise to 39°, such as for example in cases numbered 6, 39, and 48: these were fevers associated with malaria, hepatitis, etc.

Anorexia persists during the evolution of the disease, the tongue is covered with a deep and brownish coating, the breath is foul. We noticed only a few cases of nausea and vomiting was never seen. As a rule there was constipation, but no abdominal pain. Only two patients suffering from malaria had an enlargement of the spleen and another with a long career in the Tropics suffered from hepatitis and his chart was modified by this fact. None of the cases suffered disturbances in the respiratory organs. No albumin was found in the urines which were analyzed. In only one case did we have mild delirium, the temperature at that time being 40°.4 C.

The majority of the patients were depressed and tired, but their appearance did not give the impression of a serious illness. The convalescence was always rapid.

It is important to state that there were no relapses in our epidemic. In about ten cases we observed a slight desquamation on the arms, mostly in places where there was already prickly heat; but this also appeared on men who did not contract dengue.

Many writers agree in saying that dengue is extremely benign. This does not seem to be the rule in the Indo-Chinese epidemics and especially not in Saigon where the death rate was 2.12 per cent. We had two fatal cases, death being due in both instances to disturbances of the circulation. A lesion of the myocardium was present in one; it was revealed by the movements of the heart, which became at the same time weak and accelerated, by the enlargement of the cardiac area on percussion, and finally by the presence of embryocardia. A systolic murmur was heard at the apex of the heart in the second case. Bulbar disturbances, which affected the heart, also appeared at the same time.

DIAGNOSIS.

The differential diagnosis of dengue offers some difficulties; it may be confounded with certain other diseases, so that the distinctions on which we based our diagnosis are given below.

(1) The temperature chart, the absence of haematozoa, and the inefficacy of quinine permit us to exclude malaria.

(2) The symptoms have no analogy with typhoid fever, moreover our numerous serum reactions were negative.

(3) Influenza would have been accompanied by catarrh and respiratory troubles.

(4) We have already given reasons for dismissing spirillum fever by a study of the temperature charts, and it is also true that spirilla would have been discovered in the blood.

(5) Scarlet fever is accompanied by sore throat with glandular swelling, continued fever, and an eruption, none of which symptoms was present in our cases.

(6) Typhus fever, without eruption, might be confused with dengue, but only at the beginning of the illness. Later, the extreme prostration, high fever lasting for 10 or 12 days, and the terminal crisis in no way resemble our disease.

Even now, after the latest discoveries which, though important, have not revealed the cause of the disease and its specific lesions, the diagnosis still is often difficult. Formerly the confusion was so great that dengue was known by twenty-one different names in French and nineteen in English.

The eruption is a great help in the diagnosis of dengue, but to always expect this symptom may lead to many errors. Certain writers have preferred to call an epidemic of dengue, influenza or malaria, rather than admit that dengue exists without eruption. De Brun, on the contrary, writes "the skin eruption is inconstant," and later "dengue distinguishes itself (from scarlet fever and measles) by the contingency of its eruption, which not only may not exist, but also presents the greatest variability in its aspect and in its time of appearance." Cotholendy states as follows: "Some medical men affirm that eruption sometimes fails," and Martialis adds, "the eruption is not always regular and constant."

What are the relations between the different epidemics of dengue in Indo-China? The epidemic of 1907 on the *Manche* was certainly related to that of 1906, since three persons having had the first were immune against the second, although the 1906 epidemic had its origin in Tonkin and that of 1907 in Cochin-China, as we have already stated. Eruptions were present in the first, but not in the second epidemic. Consequently, in Indo-China, dengue can exist either with or without eruption. The inconstancy of the eruption, the relative malignancy, and the very divergent susceptibility of Annamese and Europeans might be mentioned as distinguishing the dengue of Indo-China from other known forms of dengue. New experimental investigations will doubtless bring forward facts which will emphasize these arguments or render them void.

TREATMENT.

(1) *Medicinal.*—Anorexia and coated tongue require laxatives. The patient should then be given a light diet. In the usual course of the disease there is no other general indication for treatment. There are no specific remedies and the different symptoms should be treated by ordinary medication. If the hyperpyrexia should become alarming, cold baths should be given. Iced compresses relieve the headache. In malignant forms, hypodermic injections of caffein and cold baths are recommended.

(2) *Prophylactic.*—Preventive measures should be directed against

mosquitoes. As in malaria and yellow fever, a patient is not himself infectious, but it is necessary to protect him against the bites of mosquitoes and to destroy these insects in the neighborhood.

The line of conduct particularly on a boat is clear. The patients should be isolated and put in rooms protected by wire gauze or landed in a place where contagious agents are lacking. The collections of water on board, as well as the bilge water, should be drained, and the boat later disinfected by means of Clayton gas. This will kill all vermin and insects. A boat infected by dengue should be put in quarantine and anchored far from the shore and from other boats. It is evident that a disease with such a great epidemicity, and which may have a death rate of 2.12 per cent warrants strict regulations. Although quarantine means an economic loss, the disorganization and cessation of work in a community caused by even a slight epidemic of dengue is still more detrimental; moreover, as the incubation period of the disease is not more than four days (Ashburn and Craig), quarantine need not be prolonged over this time, after the boat is disinfected.

CONCLUSIONS.

(1) The dengue of the *Manche* is related to other forms of dengue in Indo-China.

(2) It was distinguished by the absence of an eruption, a mortality of 2.12 per cent and the absolute immunity of the Annamese as compared with the extreme susceptibility of the Europeans.

(3) Endemo-epidemic areas of dengue exist in Indo-China, the best known and most important area being that of Saigon.

(4) The epidemic of the *Manche* again confirms the mosquito transmission theory; therefore, prophylactic measures should be directed against mosquitoes.

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ILLUSTRATION.

PLATE 1. Schematic longitudinal section of the dispatch boat *Manche*.

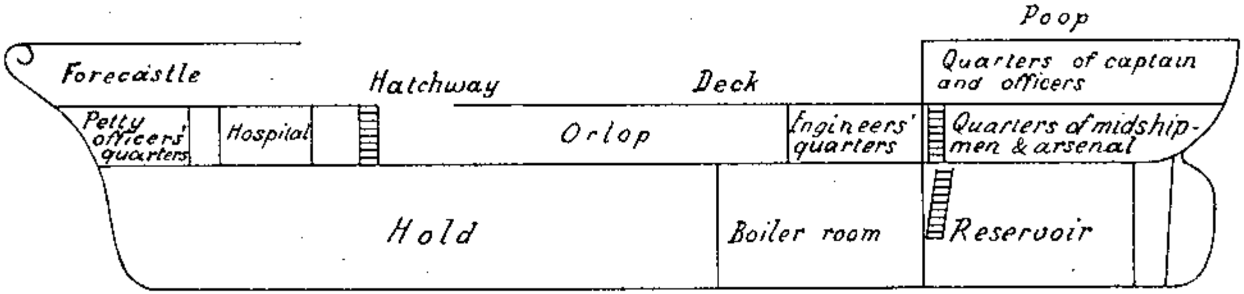
Poop
Forecastle
Hatchway
Deck
Quarters of captain and officers
Petty officers' quarters
Hospital
Orlop
Engineers' quarters
Quarters of midshipmen & arsenal
Hold
Boiler room
Reservoir

PLATE I.

FILTRATION EXPERIMENTS ON THE VIRUS OF CATTLE PLAGUE WITH CHAMBERLAND FILTERS "F".[1]

By E. H. Ruediger.

(From the Serum Section of the Biological Laboratory, Bureau of Science, Manila, P. I.)

Nicolle and Adil-Bey[2] in the year 1902 reported that the artificial peritoneal fluid (prepared by injecting a quantity of salt solution into the peritoneal cavity of a bullock sick with cattle plague and collecting the fluid about two hours later) frequently is infectious after it has been passed through the Chamberland filter marked "F."

Yersin[3] repeated the experiments of Nicolle and Adil-Bey and verified their results.

In previous reports on this subject, I was not able to verify the results obtained by the foregoing authors with the Chamberland filter "F." As only a small number of filters had been used, and those that were used were chosen at random, I decided to repeat the experiments with selected filters.

I selected four of the coarsest from a large number of Chamberland filters marked "F," the permeability of which I tested by passing distilled water through them. I designated these as b, c, d, and e. Filter b delivered a liter of distilled water in four minutes; filter c in five minutes; filter d in six minutes, and filter e delivered a liter in eight minutes.

EXPERIMENTAL.

A quantity of artificial peritoneal fluid (for which I am indebted to Dr. Thomson of the Bureau of Agriculture) was divided into five parts, *a*, *b*, *c*, *d*, and *e*. Part *a* remained unfiltered; part *b* was passed through filter b; *c* through filter c; *d* through filter d, and *e* was passed through filter designated as e.

Five bullocks were inoculated.

Bullock No. 1 received 50 cubic centimeters of part *a* under the skin on the 6th day of January. On the ninth day of January the temperature rose rapidly to 40°.7 C. Symptoms of cattle plague declared themselves and on the eleventh the bullock was bled to death. (Chart No. 1.)

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[1] Read at the 6th Annual Meeting of the Philippine Islands Medical Association, February 11, 1909.

[2] *Ann. Inst. Pasteur* (1902), **16**, 56.

[3] *Ibid* (1904), **18**, 429.

Bullock No. 2 was inoculated with 50 cubic centimeters of filtrate *b*. It remained well. Fourteen days later it received an injection of 10 cubic centimeters of virulent blood from which it contracted cattle plague and was bled to death. (Chart No. 2.)

Bullock No. 3 received 50 cubic centimeters of filtrate *c* on the sixth day of January and remained well. On the twentieth he was inoculated with 10 cubic centimeters of virulent blood; cattle plague soon made its appearance and he was bled to death on the twenty-sixth. (Chart No. 3.)

Bullock No. 4 was inoculated with 50 cubic centimeters of part *d* and remained well. Fourteen days later he received 10 cubic centimeters of virulent blood; he contracted cattle plague and was bled to death on the sixth day after inoculation. (Chart No. 4.)

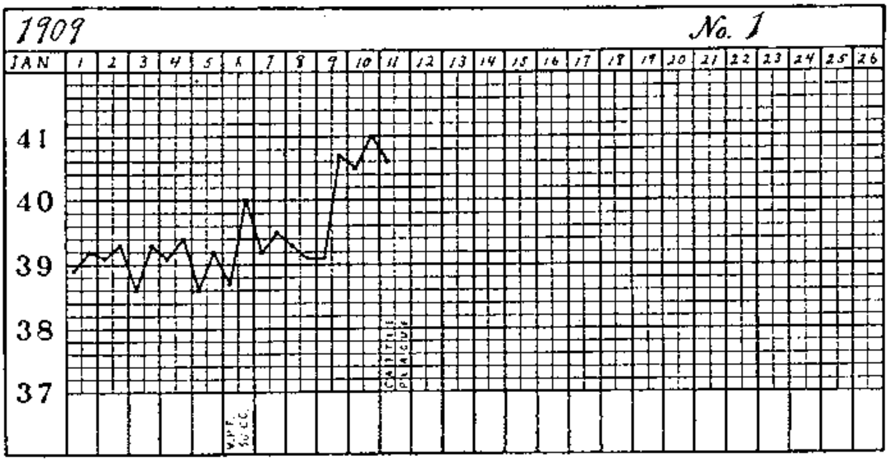
Animal No. 5 remained well after a subcutaneous injection of 50 cubic centimeters of filtrate *e* on the sixth day of January. Ten cubic centimeters of virulent blood were injected on the twentieth. On the twenty-sixth day of January he was bled to death suffering from typical cattle plague. (Chart No. 5.)

CONCLUSION.

From the experiments previously reported and those recorded here it is evident that even on carefully selecting the most porous of the Chamberland filters marked "F" none have been found which allowed the virus of cattle plague to pass.

ILLUSTRATIONS.

Charts numbered 1 to 5. 39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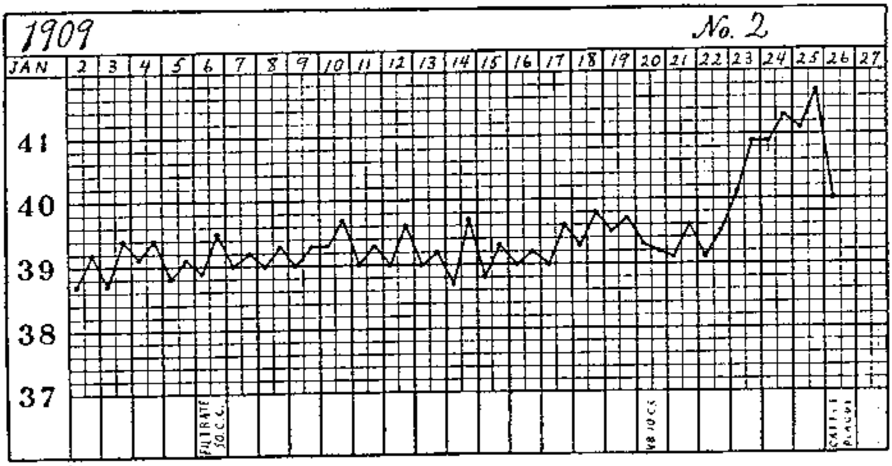
V.P.F. 50 C.C.
CATTLE PLAGUE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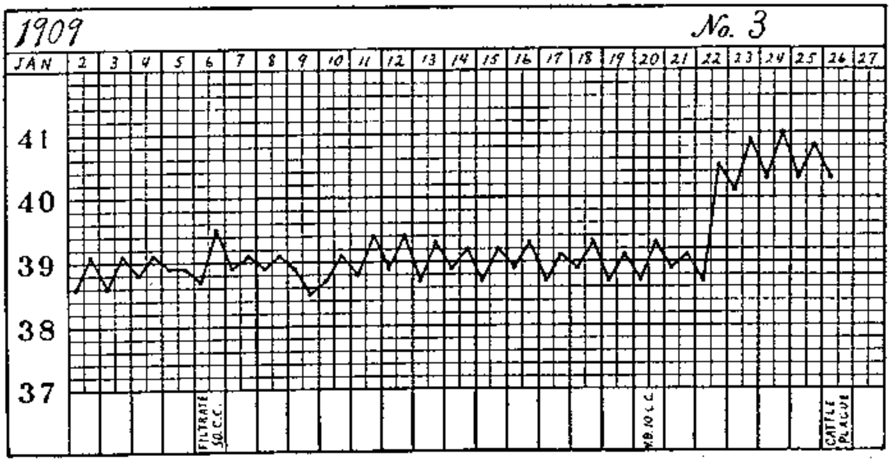
CATTLE PLAGUE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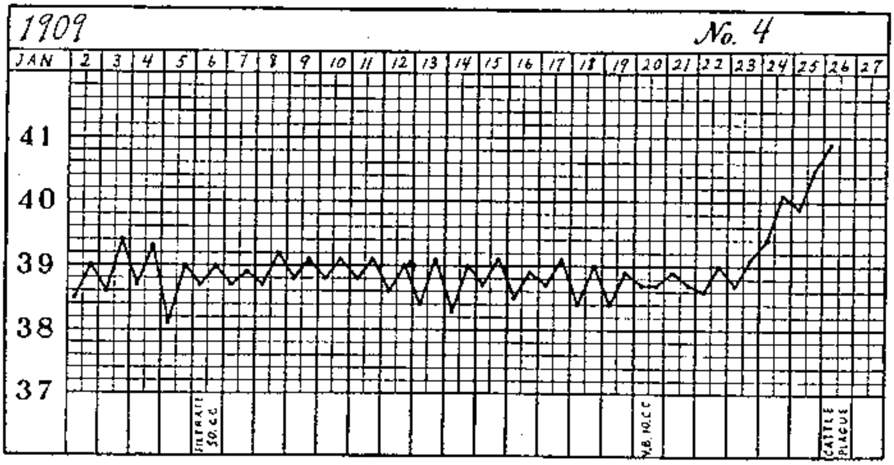
CATTLE PLAGUE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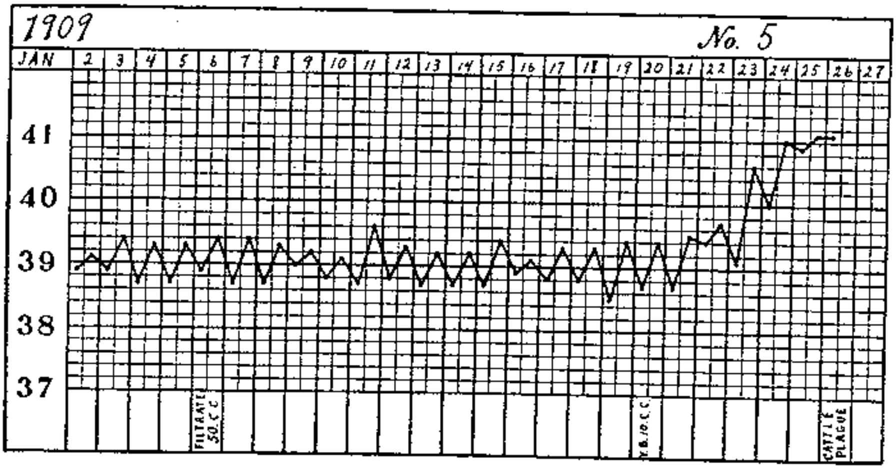
CATTLE PLAGUE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FILTRATE 50 C.C.
V.B. 10 C.C.
CATTLE PLAGUE

THE SUPPRESSION OF A CHOLERA EPIDEMIC IN MANILA.[1]

By Allan McLaughlin.[2]

The cholera epidemic of September, 1908, was probably a continuation of the outbreak which had its greatest intensity in January of the same year.

There were 184 cases of cholera in Manila in January, 1908. In February, 14 cases of cholera were registered, and in March 3 cases. In April, cases resembling cholera clinically began to present themselves, which bacteriologically were negative. In May, one case bacteriologically positive was reported on the 14th. One case of true cholera was found on the 11th of June, and suspicious cases, resembling cholera clinically, but negative bacteriologically, were found on the 3rd, 4th, 18th, 19th, 24th (2), 27th, 28th, and 29th. These cases resembled the true clinical picture of cholera more closely from day to day. Some were fatal in a few hours, and the intestinal contents yielded a motile vibrio which resembled the cholera vibrio, but did not respond to the agglutination test.

These suspicious cases continued in July as follows:

Date.	Cases of suspected cholera.	Bacteriologic findings.
July 4	1	Negative.
July 8	1	Do.
July 11	1	Do.
July 13	1	Do.
July 14	1	Do.

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[1] Read at the meeting of the Manila Medical Society, October 19, 1908.

[2] Passed assistant surgeon, Public Health and Marine-Hospital Service, Acting Director of Health for the Philippine Islands.

On July 16 a case of typical cholera was found and thereafter cases appeared in July as follows:

Date.	Number of cases.	Bacteriologic findings.
July 21	1	True cholera.
July 22	1	Do.
July 26	2	Do.
July 28	4	Do.
July 29	3	Do.
July 30	4	Do.
July 31	2	Do.

In August, cases of cholera, bacteriologically confirmed, were as follows:

Date.	Number of cases.	Date.	Number of cases.
August 1	2	August 20	1
August 2	1	August 21	1
August 3	2	August 23	3
August 5	1	August 24	4
August 6	4	August 25	2
August 7	1	August 26	3
August 8	2	August 27	6
August 9	2	August 28	1
August 10	2	August 29	2
August 13	3	August 30	5
August 17	1	August 31	5
August 19	1		

September, 1908. These cases need only to be seen at the bedside or at autopsy to recognize the possibility that they may be cases of cholera in which the vibrio has lost some of its properties, including its agglutinability with high dilutions of anticholera serum.

Kolle,[3] in a series of vibrios taken from cases in Egypt, which clinically were cholera, found only a few vibrios which did not agglutinate with anticholera serum. Kolle's conclusion was that these cases were cholera, but that the cholera organism was not isolated because of faulty technique. His contention is that other vibrios are sometimes found in the human intestine; these, in the enriching fluid, grow more vigorously than the cholera vibrios, and so the investigator may easily fail to isolate the cholera organisms. This seems unlikely to occur in any considerable number of cases, especially if the transfer to the hard media is made directly from the stool, or after a very short time of growth in the peptone solution.

In September, from the 1st up to the 9th, there was an average of about three cases daily. On the 10th the cases reached seven, on the 11th nine, and on the 12th seventeen. The course of the disease is well defined on the chart showing the cases from September 1 to October 12, 1908.

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[3] *Ztchr. f. Hyg. u. Infectionskrankh.* (1903), 44, 1.

Date.	Number of cases.	Date.	Number of cases.
September 1	8	September 17	25
September 2	1	September 18	24
September 4	6	September 19	43
September 5	4	September 20	60
September 6	4	September 21	55
September 7	4	September 22	38
September 8	5	September 23	45
September 9	3	September 24	40
September 10	7	September 25	44
September 11	9	September 26	37
September 12	17	September 27	14
September 13	11	September 28	18
September 14	10	September 29	13
September 15	16	September 30	11
September 16	37		

Date.	Number of cases.	Date.	Number of cases.
October 1	12	October 7	8
October 2	10	October 8	13
October 3	5	October 9	8
October 4	9	October 10	6
October 5	11	October 11	3
October 6	6	October 12	4

The high-water mark of the epidemic was reached on September 20, when 60 cases were reported in twenty-four hours.

When the number of cases reached 9, on September 11, I recognized the probability of an epidemic, and took personal charge of the operations. Upon September 12 the number reached 17, 12 being in the Meisic district. Upon investigating this district, I found that in 18 cholera houses—that is, houses in which cases of cholera had occurred—the closet was in a filthy condition in every instance. These houses had the following combination: Filthy closets, rats, flies, cockroaches, and other insects, and a kitchen immediately adjoining the closet. With this condition, all that is necessary is the presence of the bacilli carrier, who, by using the closet, will furnish the infective material.

Two additional disinfecting squads were put to work immediately for the exclusive duty of disinfecting closets, and on the 13th the cases dropped to 11, and on the 14th to 10. On the 15th sixteen cases occurred, and 105 additional men were employed. This force was increased as rapidly as possible without causing confusion and disorganization, and by September 22 the complete organization of 500 men was working smoothly. This force was increased by the 25th to 600 men.

ORGANIZATION.

The property division of the Bureau of Health purchased all supplies and equipment, with a very slight increase of personnel. The statistical division of the same Bureau took care of the records and statistics. The clerical division handled all financial transactions and current business. The department of sanitation and transportation of the city of Manila furnished ambulances, tank wagons, carretelas, carromatas, and horses.

The boundaries of the health districts already existing were left unchanged, the city being divided as follows:

Station "J", Intramuros, including Malate and Ermita.
Station "L", Paco, including Santa Ana, Pandacan, etc.
Station "A", Meisic, including Binondo, Quiapo, and Santa Cruz.
Station "C", Tondo.
Station "I", Sampaloc.

The office force of each station was not increased, but the field force was enormously augmented.

The organization of the field force in each district was as follows:

STATION "A", MEISIC DISTRICT.

1 medical inspector, in charge of district.
3 municipal physicians, assistants to medical officer in charge.
1 sanitary inspector, in charge of all the men.
1 sanitary inspector, for inspection of disinfecting gangs and quarantines.
12 American foremen, each in charge of a lime squad.
124 Filipino lime throwers.
2 American foremen, each in charge of a disinfecting tank wagon and 6 men.
12 Filipinos, 6 for each disinfecting wagon.
1 chemical fire engine and crew.
1 disinfecting carretela, with crew of 5 men, disinfectants, and hand pumps; for room disinfection of cholera infected houses.

Total personnel of station.

4 medical officers.
2 sanitary inspectors.
14 foremen.
136 Filipino laborers.
5 Filipino disinfectors.
Total, 161.

STATION "C", TONDO DISTRICT.

1 medical inspector, in charge of district.
2 municipal physicians, assistants to medical inspector.
1 sanitary inspector, in charge of all the men.
3 American foremen, in charge of lime squad.
1 American in charge of disinfection of wells and pools.
64 Filipino lime throwers.
3 foremen, each in charge of large disinfecting tank and 6 men.
1 foreman, in charge of small tank wagon and 4 men.
22 Filipinos, on disinfecting wagons.
1 chemical fire engine and crew.
1 disinfecting carretela with 5 men.

Total personnel of station.

3 medical officers.
1 sanitary inspector.
8 foremen.
86 Filipino laborers.
5 disinfectors.
Total, 103.

STATION "J", INTRAMUROS.

1 medical inspector, in charge of district.
1 municipal physician, assistant to medical inspector.
1 sanitary inspector, in direct charge of all the men.
1 sanitary inspector, in charge of disinfecting crews.
1 disinfecting carretela, crew of 5 men. Day duty.
1 disinfecting carretela, crew of 5 men. Night duty.
6 American foremen, in charge of lime squads.
100 Filipino lime throwers.
3 American foremen, each in charge of disinfecting tank wagon.
17 Filipinos, disinfecting tank wagons.
1 chemical fire engine and crew.

Total personnel of station.

2 medical officers.
2 sanitary inspectors.
9 foremen.
117 Filipino laborers.
10 disinfectors.
Total, 140.

STATION "I", SAMPALOC DISTRICT.

1 medical inspector, in charge of district.
1 municipal physician, assistant to medical inspector.
1 sanitary inspector, in charge of all the men.
4 American foremen, in charge of lime squads; 25 men each.
100 Filipino lime throwers.
2 American foremen, each in charge of tank wagon and 6 men.
12 Filipinos, 6 on each tank wagon.
1 chemical fire engine and crew.
1 disinfecting carretela with crew of 5 men.

Total personnel of station.

2 medical officers.
1 sanitary inspector.
6 American foremen.
112 Filipino laborers.
5 disinfectors.
Total, 126.

STATION "L", PACO DISTRICT.

1 medical inspector, in charge of district.
1 sanitary inspector, in charge of all the men.
1 municipal physician, assistant to medical inspector.
1 foreman, in charge of tank wagon and 6 men.
6 Filipinos on tank wagons.
3 foremen, in charge of lime squads.
52 Filipino lime throwers.
1 disinfecting carretela, with crew of 5 men.

Total personnel of station.

2 medical officers.
1 sanitary inspector.
4 foremen.
58 Filipino laborers.
5 disinfectors.
Total, 70.

Total personnel, all stations.[3]

Station.	Medical officers.	Sanitary inspectors.	Foremen.	Laborers.	Disinfectors.	Total.
"A", Meisic	4	2	14	136	5	161
"C", Tondo	3	1	8	86	5	103
"I", Sampaloc	2	1	6	112	5	126
"J", Intramuros	2	2	9	117	10	140
"L", Paco	2	1	4	58	5	70
Total	13	7	41	509	30	600

Lime squads varied in size according to the district. In open, or sparsely settled districts, one foreman could properly supervise from 15 to 25 men. In a district like Meisic, where the houses are crowded together, a foreman could not properly supervise more than 12 men.

One mechanic was assigned to the duty of keeping the disinfection wagons, pumps, and hose in good condition. He traveled from wagon to wagon with tools, thus avoiding sending the wagon in for repairs, which were often trivial and could be made in a few minutes on the spot.

The amount of disinfectants employed was enormous, about 150,000 pounds of lime per day, and about 700 gallons of carbolic acid daily were used, or its equivalent in creoline, tricresol, or formalin. There was some difficulty in securing enough disinfectants to satisfy this enormous demand. The entire stock of carbolic acid, formalin, and tricresol, in the Philippine Islands, was used before the end of September. Four thousand gallons of Jeyes' fluid (a creolin preparation) was secured from Hongkong and Japan in time to prevent the wagons lying idle. Four of the 11 tank wagons might have lost two days because of a lack of disinfectants, but Dr. Raymond F. Bacon, of the Bureau of Science, suggested that salt water be electrolyzed, forming a disinfecting fluid, which, according to laboratory tests, would kill cholera bacilli promptly. The offer of the Bureau of Science to electrolyze the solution was accepted, and for two days, four of the wagons used this fluid.

In a short time all the lime in Manila and the vicinity was exhausted and the entire daily output of the kilns in the Island of Luzon was taken.

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[3] This does not include police for house-to-house inspection, nor some 300 men of the city street cleaning force, who have been assisting in draining the worst places in the barrios, nor the Constabulary for quarantine guards.

The lack of lime sometimes caused the cessation of lime disinfection at 3 or 4 o'clock in the afternoon, but lime squads were equipped with shovels, hoes, rakes, brooms, or other instruments, for cleaning houses and grounds, and their spare time was utilized in digging ditches, and cleaning up the yards of premises.

Infected districts were subdivided into subdistricts; maps were made of these subdistricts, and the foreman in charge of a disinfecting wagon or lime squad was furnished with a map of his subdistrict. For example, Meisic was subdivided into 20 subdistricts, and Tondo into 14.

The ordinary chemical fire engine makes an excellent disinfecting apparatus. The 80-gallon tanks are charged by carbon dioxide produced from bicarbonate of soda and sulphuric acid; to make an efficient disinfecting solution it is only necessary to add carbolic acid, creoline, or some other disinfectant to this solution. The ordinary street-sprinkling wagon is convertible into an excellent disinfecting apparatus. All that is necessary is to install an ordinary pressure pump and several hundred feet of hose, put in the disinfectant, and fill the tank from the street hydrant. We used eleven of these wagons and four chemical engines, and they were all effective. The tank wagon possessed the advantage of being cheaper, as the cost of soda and sulphuric acid for charging the chemical engine is not inconsiderable. In Manila the cost was offset by receiving the services of the chemical-engine crew free of charge.

Several kinds of disinfectants were used in the tank wagons. Crystalline carbolic acid does not mix readily with water in excess of the amount dissolved, and requires careful handling in using it on a large scale. Formalin is good, but causes a great deal of complaint from the people because of its irritating properties. Crude carbolic acid, in our experience, did not mix well, and both kinds of carbolic acid, because of irregular distribution of the undissolved portion in the solution, gave rise to minor accidents, such as burning of the hands and feet of the laborers, and the killing of dogs and chickens. The most satisfactory disinfectant was Jeyes' fluid, a creoline preparation which we secured from Hongkong. It is nearly "foolproof" and is very effective. It mixes perfectly with water, forming a milky solution of uniform strength. It does not burn the hands or feet of the laborers or children about the house, and no ill effects upon animals or chickens were noticed.

The simplest and most effective way to use lime is with a bucket and a ladle. The lime gang of from 15 to 25 men was handled by one white foreman and one native *capataz*. Each gang was followed by a cart with lime. Each native lime thrower carried a bucket and scoop or ladle. After a little patient instruction, the natives learned to use the lime to the best advantage, to place it where it was needed, and to avoid the spots where it was unnecessary. Their instructions were definite and included liming all closets and places where fæcal matter existed or was likely to be deposited.

Each chemical engine was handled by its own crew in charge of a lieutenant of the fire department.

Each tank wagon was in charge of an American foreman, who directed the disinfection and was responsible for the thoroughness of the work and for the conduct of the six natives who manned the pump and hose.

In giving foremen their instructions, great stress was laid upon the necessity of displaying courtesy at all times. They were instructed to take part in no argument with householders or others, and to do their work with consideration for the feelings of the people, but none the less thoroughly. If actual obstructions were encountered, they were to notify the central office at once. The result of these instructions was that during the whole campaign the valid complaints were less than a dozen. All complaints were promptly investigated by the Acting Director of Health, and if found to be valid, the foreman in charge was dismissed. Only one case of actual obstruction was encountered; this man refused to permit the disinfectors to enter; he was arrested, fined fifty pesos Philippine currency, (twenty-five dollars United States currency) and no further trouble occurred.

The organization was mobile, and concentration of disinfecting wagons from Paco, Intramuros, and Sampaloc, as a reënforcement of Meisic and Tondo, was effected when necessary, with good results.

The general plan of campaign was as follows:

House-to-house inspection by police to discover promptly cases of cholera.

Constabulary guard upon house and inmates to prevent ingress or egress until removal of the patient and disinfection of the house.

Examination of the stools of cholera contacts to find bacilli carriers, the bacilli carriers being sent to San Lazaro Hospital for treatment.

Daily disinfection of all insanitary closets with lime, and disinfection of ground surfaces known to be, or suspected of being, soiled with fæcal matter.

An attempt was made to disinfect daily all closets in the strong material districts, which were not flush closets or which were not kept clean. In the light material districts, the effort to disinfect the dejecta of the entire population necessitated the disinfection of entire districts. It was necessary to disinfect practically the whole ground area. When one considers the enormous area to be covered daily in Tondo, Sampaloc, Malate, and Paco, with their outlying barrios, and the fact that there are over 5,000 insanitary closets in the Meisic district alone, the magnitude of this work may be imagined.

Two general methods of disinfecting were employed—(1) the spreading of lime, and (2) disinfection with water wagons, hose and pump, or by chemical engines, containing carbolic acid, creoline, formalin, or other disinfecting material.

Lime was effective in conjunction with drainage in the low-lying, swampy, nipa districts and also for disinfecting the bad closets in the strong material districts. The tank wagons and chemical engines were used for general disinfection of lower floors, out-houses, patios, stables, and closets in both strong and light material districts.

Two factors, more than any others, make difficult the suppression of cholera in Manila—(1) the existence of bacilli carriers and bad closet facilities or none at all; (2) failure to find cases in the early stages of the disease.

The presence of bacilli carriers makes necessary the safe disposal or disinfection of the dejecta of the entire population.

The experience of the writer in the recent epidemic points to the fact that the most important role in the transmission of cholera is played by the bacilli carrier.

If a bacilli carrier is a person of cleanly habits, and if he is in possession and makes use of proper closet facilities, he is practically harmless. But on the other hand, a bacilli carrier of filthy habits, who has no closet facilities, or refuses to avail himself of the public closets furnished him, is the greatest menace to the public health which can possibly exist, so far as cholera is concerned. The demonstration of the fact that over 7 per cent of apparently healthy individuals in the Meisic and Tondo districts were bacilli carriers, coupled with the insanitary closets of Meisic district and the absence of or failure to use public closets in the nipa districts, will go far toward explaining the dissemination of cholera in Manila this year.

Every effort was made to discover promptly light cases of the disease and bacilli carriers. When a case of cholera was found, the house was quarantined until the removal of the patient and until the disinfection had been completed. The stools of the other inmates were taken for the purpose of discovering bacilli carriers. These, if found, were sent to the San Lazaro Hospital and there detained until the vibrios disappeared from their stools. A house-to-house inspection was made of a large area, having the infected house for a center. This was done daily for five days.

The following tables show the number of apparently healthy persons examined by the Biological Laboratory of the Bureau of Science for cholera bacilli, and how many were really carrying the bacilli:

Bilibid Prison.

Number of persons examined	264
Number found positive	17
Percentage found positive	6.44

City of Manila (exclusive of all hospitals and Bilibid Prison).

Number of persons examined	376
Number found positive	27
Number found negative but containing vibrios other than cholera	46
Percentage found positive	7.18
Percentage found negative but containing other vibrios than cholera	12.23

Even with perfect, daily disinfection of closets and places soiled with fæcal matter, all chance of infection from bacilli carriers is not cut off, because a bacilli carrier with his soiled fingers may infect the food or drink of other persons.

The prohibition of certain native foods, fruits, and vegetables was necessary, not only because these substances were often infected or dangerous of themselves, but they were also the substances carelessly handled by dirty people of dirty habits, many of whom were undoubtedly bacilli carriers, and they were the substances which were eaten without sterilization by boiling or cooking, after such handling.

It has been demonstrated this year that the perennial outbreaks of cholera in Bilibid Prison are probably due to bacilli carriers. Upon the appearance of cholera in Bilibid Prison this year, the writer gave orders that stools of those who had anything to do with the preparation or handling of food or drink be taken to be examined for cholera. Two hundred and sixty-four samples were taken and of this number of apparently healthy persons, 17 were found to be carrying the cholera organisms in their intestines. To find out and isolate all the other bacilli carriers would have involved an amount of work in stool examinations alone which would have been impossible for the already overtaxed bacteriologists of the Biological Laboratory.

Results were obtained by an order from the writer to compel washing of the hands in disinfecting solution after stool and before eating. This order was enforced and cases ceased to appear, although there were doubtless many bacilli carriers in the 3,000 prisoners whose stools had not been examined.

THE SPREAD OF THE INFECTION.

The practice of taking stools had to be discontinued when the cases increased to such an extent that it was no longer possible to do so. For the same reason, the house-to-house inspection areas had to be supplanted by general house-to-house inspection of the whole city when the number of infected houses—that is, houses in which cholera had appeared within five days—reached 200.

Failure to find cases of cholera early makes the suppression of the disease difficult. Cases, even with the house-to-house inspection, are sick from two to twenty-four hours before discovery. Upon discovery, a quarantine guard is placed upon the house and inmates, and from this point that particular focus is adequately cared for, but, in the hours before discovery other individuals probably have been infected.

When a Filipino falls ill, all the neighbors will, either through interest or curiosity, crowd into the house. Upon discovery, or upon decision of the householder or doctor, to report the case, these people promptly scatter, go to their meals without washing their infected hands, eat their rice with these same infected hands, and even carry with them from the

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To illustrate the spread of the infection in this way, the course of the disease in the Meisic district may be taken as an example. It will be observed that every four days there is a sudden increase in the number of cases. These are the persons infected from the cases of four days previously. It does not mean an incubation of four days, for these cases when found have already been sick for some time, but it would indicate an incubation of from two to three days.

Counting a house where cholera had been found within five days as a focus, on September 23 there were 241 infected foci in the city of Manila, well scattered, as is shown by the following table:

District.	Number infected foci.
Meisic	66
Tondo	59
Sampaloc	41
Intramuros	54
Paco	21
Total	241

With the organization and the employment of the measures outlined above, in twelve days, the number of cases was reduced from 60, the maximum number in one day (September 20), to 5 cases on October 3. A few cases occurred daily throughout October, and these, in nearly every instance, came from well-known cholera areas, districts in which cholera persists after its eradication from the more cleanly and sanitary portions of the city.

For example, of the last 75 cases in October, 33.3 per cent occurred in the district bounded by Calles Bilibid and Paz on the south, Calle Magdalena and San Lazaro Estero on the west, the railroad on the north, and Calle Felix Huertas on the east. This district has no surface drainage, the interiors are lower than the street gutters of Calle Cervantes, and the majority of the houses, during a great part of the year, stand over collections of filthy water, slime, and muck. This office demonstrated to the city authorities the feasibility of draining this area by ditches and the drainage work is now in progress.

Nine per cent occurred in a triangle formed by Calle Azcarraga on one side, Tondo beach on the second side, and Calle Ylaya and Calle Quesada on the third, one of the best examples of the illegal perpetuation of the nipa hut in the strong material district.

Eight per cent occurred on the upper end of Calle Lemery and its continuation Gagabangin, where drainage problems also remain to be solved.

Nine per cent occurred in a small section of the Meisic district, bounded by Calles Aceiteros, Santo Cristo, San Nicolas, and Madrid. This district contains the filthiest and most insanitary closets in the city of Manila.

Four per cent occurred in the barrio of Balicbalic; other cases occurred in Palomar, in Calle Antonio Rivera, in Bancusay, and in other barrios. The

DISPOSAL OF HUMAN EXCRETA.

The new sewer system is another sanitary improvement anxiously awaited. The existence in the Meisic district of thousands of tight vaults and filthy closets is responsible in a great measure for the spread of cholera in that district and the difficulty experienced in eradicating the disease. These filthy closets and tight vaults can be replaced by modern flush closets connected with the new sewer system. In the newer residence districts, septic vaults and absorbing basins are used as receivers of sewage from modern flush closets. It will be an improvement when all vaults, however satisfactory in construction, are no longer necessary, because of the installation of the new system.

In the nipa districts, the people depend upon the sparsely scattered public closets or have no closet facilities whatever. In the latter instance, the fæcal matter is deposited in the most convenient place; in the long grass, in pools or gutters, or under the house. The family pig takes care of a considerable quantity of human excreta and garbage. There are large barrios within the limits of the city of Manila where the only way of entrance is a path too narrow to permit a wagon to enter. These, of course, have no garbage collection or closet facilities.

Habits of cleanliness are best secured by a campaign of popular education. Excluding the water supply and the disposal of fæces, the other factors in spreading infection can be nullified by the inculcation of cleanly habits. It the bacilli carrier washed his hands often enough and at the proper times he would not transfer infection from his dirty fingers to the food or drink of others. If the kindly, native neighbors who assist those sick with cholera, and who disappear before the arrival of the health officers, can be taught the necessity of washing their hands before eating or handling food, many more cases will be prevented.

The Bureau of Health has printed cholera circulars in Spanish, English, and all the native dialects, telling how to preserve one's self and others against the infection of cholera. This campaign is best conducted in the schoolroom and from the pulpit. The Bureau of Education and the Roman Catholic Church have coöperated in an attempt to spread the knowledge and advice contained in the cholera circulars among the people. Efforts along this line have met with success, but it requires a long time completely to change the habits of a people and it will probably require another generation to complete the work.

MEASURES LOOKING TO THE PREVENTION OF FUTURE EPIDEMICS.

The writer has made, in his report to the honorable the Secretary of the Interior the following recommendation, calculated to prevent the recurrence of cholera in epidemic form in Manila. The difficulties which attend the carrying out of these projects are recognized as well-nigh

other 20 cases were scattered and widely separated; 3 in Paco, 5 in Meisic, 5 in Sampaloc, 1 in Ermita, 1 off the Malecon Drive, 1 in Malate, and 3 in Tondo; less than 10 per cent were found in the strong material district, and most of these could be traced to one of the above-mentioned plague spots.

Cholera is the same disease, whether encountered in Germany, Russia, Italy, Egypt, India, or the Philippines, but the measures taken to prevent its spread and to suppress the infection depend upon the geographical location of the epidemic. To suppress a cholera epidemic in a country like Germany, for example, is a comparatively simple proposition; while in the Philippines its suppression is complicated by existing conditions peculiar to these Islands.

Four things are of prime importance for the suppression of cholera: (1) A good water supply for all the people; (2) safe disposal of the dejecta of the entire population; (3) prompt discovery of cholera cases, suspects, or bacilli carriers, with immediate isolation and disinfection, and (4) habits of cleanliness.

If the water supply is free from cholera and can be kept so, then the spread of the epidemic depends upon the improperly cared for stools of the persons carrying the spirilla of cholera. Flies, cock-roaches, and other insects or animals having access to such stools carry the infection to food or drink. There is infection from persons who do not wash their hands and whose soiled fingers carry the infection to food or drink. There is also direct infection from actual cases of cholera.

WATER.

Manila city water has been examined daily by the Biological Laboratory of the Bureau of Science and the cholera bacilli have not been found therein. However, with the appearance of cholera in San Mateo and Mariquina, it was deemed prudent to place a military guard to prevent possible pollution of the river.

The new water supply, taken from higher up the gorge, will be practically safe from contamination by human excrement.

The great trouble with the Manila water supply is that it does not reach all the people. Some barrios are at a great distance from the nearest hydrants, and the people must carry, or pay for carrying, a long distance. As a result, they use the water from shallow wells, ponds, esteros, or other questionable sources, for washing clothes, kitchen utensils, and also in many instances for drinking purposes.

It was deemed necessary to close all wells, except a few in the more distant barrios, which were treated with permanganate of potash. Besides closing wells, wherever possible, all stagnant places were drained by digging ditches and certain small, infected esteros were patrolled by the Constabulary to prevent the people using the water.

insuperable, but they are not impossible ideals, and an attempt to realize these ideals should be the policy of the bureau.

The Manila city water supply must be extended to every part of the city and placed within easy reach of everyone.

Tanks and reservoirs must be so constructed as to preclude the possibility of contamination.

Esteros must be controlled and confined to definite beds either by adequate walls or by dredging, so that any overflow land will be drained by tides.

The filling in of low places which can not be drained to the proper height above the curb is essential.

Public closets must be established in all barrios, so that every inhabitant of the city of Manila will have closet facilities at his disposal. It is advisable to have more closets even if of less seating capacity; six closets of six pails each will be of more value than three of twelve pails each, for the reason that the native has a shorter distance to travel. Also, the cutting of alleys through the back yards will facilitate his journey to the closet.

Before permitting land to be used for building purposes within the city limits, the land should be subdivided by streets and alleys upon a definite plan. The indiscriminate building of nipa huts upon the interior of a block without order or regard for necessary intervening spaces, should not be permitted.

Streets and alleys should be cut through already existing collections of nipa huts, and, when necessary, houses removed to permit proper spacing. Streets must be opened into barrios within the city limits which are now isolated and have no wagon road entering them to permit the collection of garbage and refuse.

A sufficient force of sanitary police to enforce the use and sanitary maintenance of closets is necessary.

All wells must be filled in.

More stringent measures to compel the prompt reporting of suspicious cases, with severe penalties for infractions of this ordinance should be adopted.

Stricter enforcement of the building code in the erection of new buildings is necessary.

Nipa huts in the strong material districts must go, and repair to old nipa houses, which perpetuate this problem, must be prevented. These nipa districts exist by sufferance within the strong material districts, dilapidated huts are crowded together in the most insanitary manner, where there are excellent public closets, patronized only by a select few. The majority still find it easier to deposit or throw their dejecta upon the swampy ground. These districts are the natural home of cholera, and from there the people who are trying to live decently are infected by means of *muchachos*, cooks, or *cocheros*, who spend their spare time in these plague spots.

A proper system of surface drainage for every part of the city of Manila is essential, where such drainage is lacking, but especially for (1) the San Lazaro Estate and that portion of the city from the San Lazaro Estate to the railroad crossing on both sides of Calle Cervantes, (2) Santa Monica, (3) Antonio, Rivera, (4) Palomar and Magdalena interior, (5) that portion of Tondo north of Moriones and west of Estero de la Reina, and (6) Malate district, bounded by Herran, Wright, San Andres, and Nueva.

For the "Discussion" of Dr. McLaughlin's article see under "Editorial," p. 59.

ILLUSTRATIONS.

PLATE I.

FIG. 1. Lime cart and laborers accompanying each lime squad.
  2. Lime squad.

PLATE II.

FIG. 1. Chemical fire engine converted into disinfecting apparatus.
  2. Street sprinkler converted into disinfecting wagon.

PLATE III.

FIG. 1. Small water cart converted into disinfecting apparatus.
  2. Temporary public closet installed pending erection of permanent midden sheds.

CHART 1. Showing various health districts of Manila.
  2. Showing infected houses for five days ended September 23, 1908.
  3. Showing prevalence of cholera in Manila from September 6 to November 6, 1908.
  4. Showing prevalence of cholera in Manila from September 6 to November 6, 1908.

MAP 1. Health district of Tondo. Subdistrict No. 3. Sample of maps furnished to foremen of disinfecting squads or wagons.
  2. Health district of Meisic. Subdistrict No. 3. This subdistrict contained the filthiest and most insanitary closets in the city.

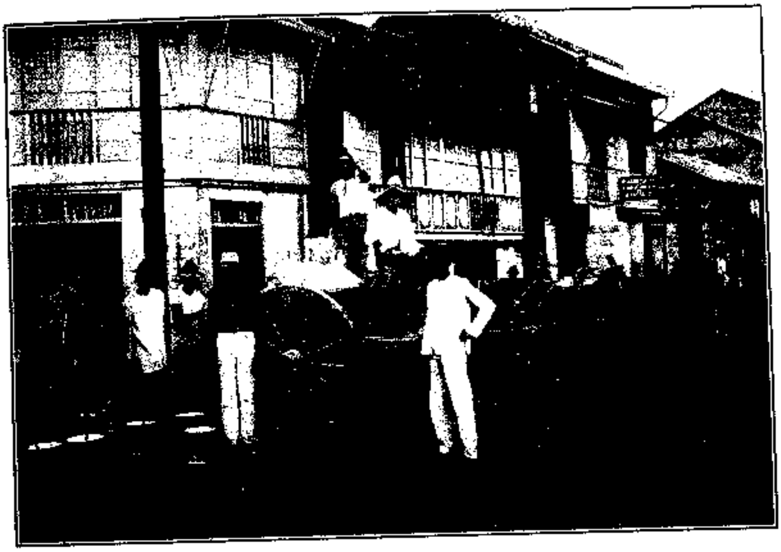


Fig. 1.

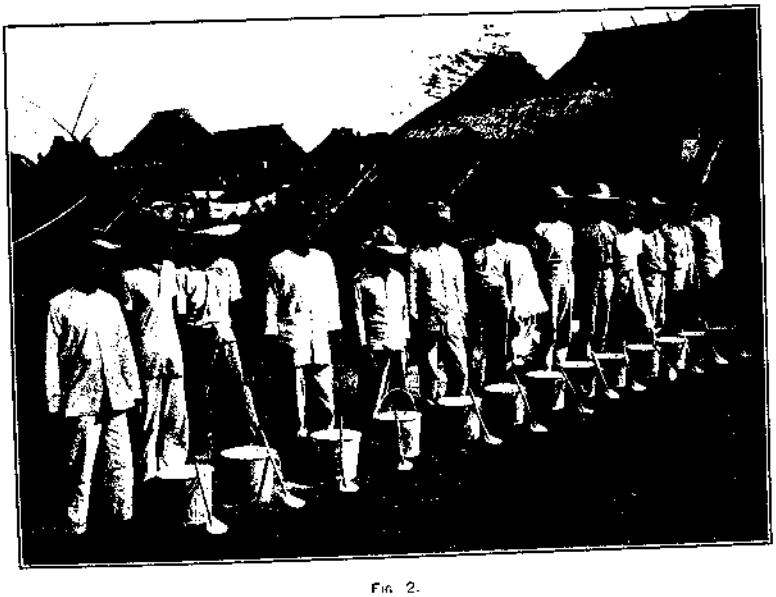


Fig. 2.

PLATE I.

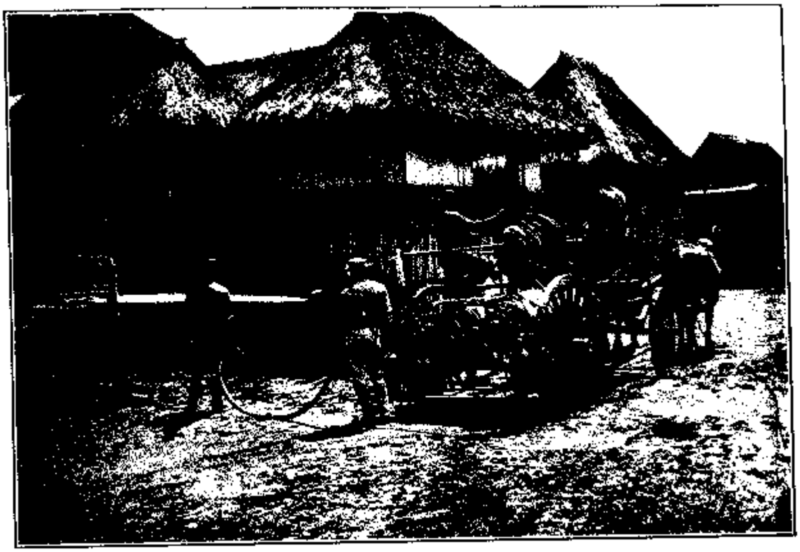


Fig. 1.

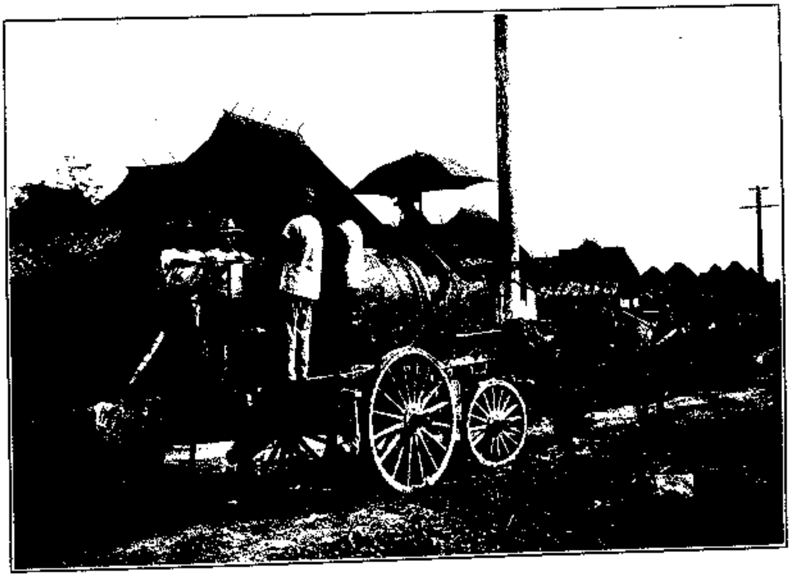


Fig. 2.

PLATE II.

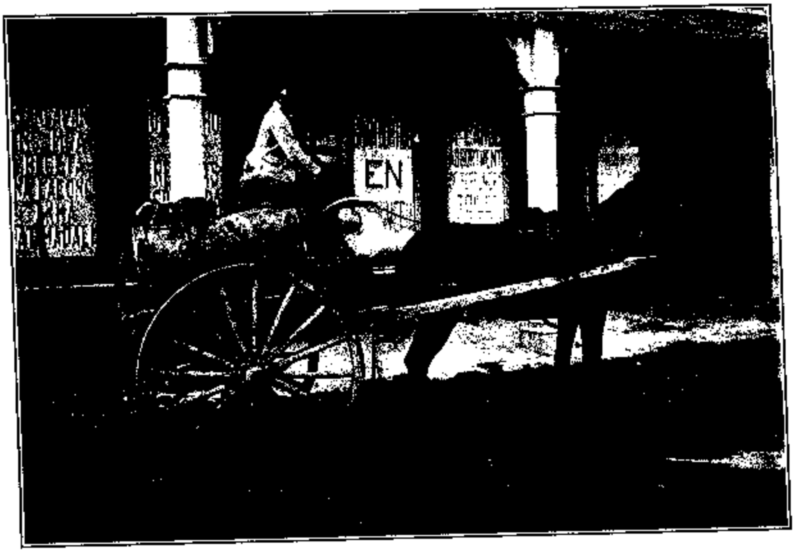


Fig. 1.

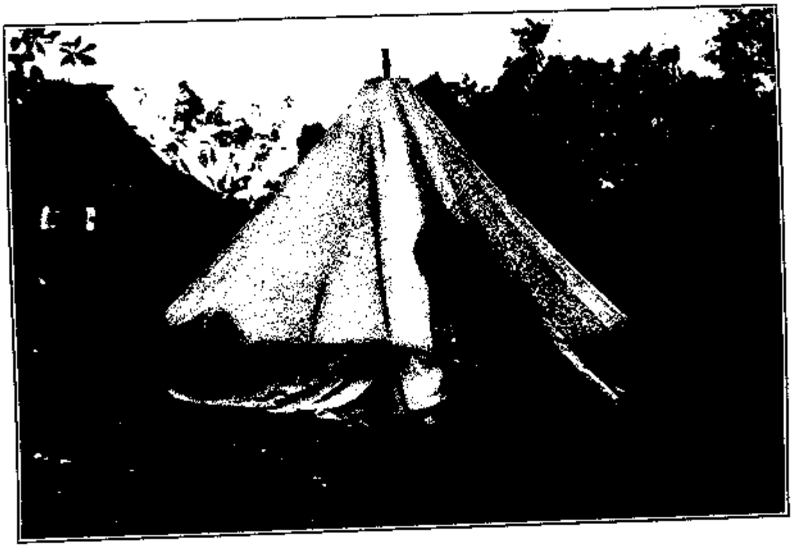


Fig. 2.

PLATE III.

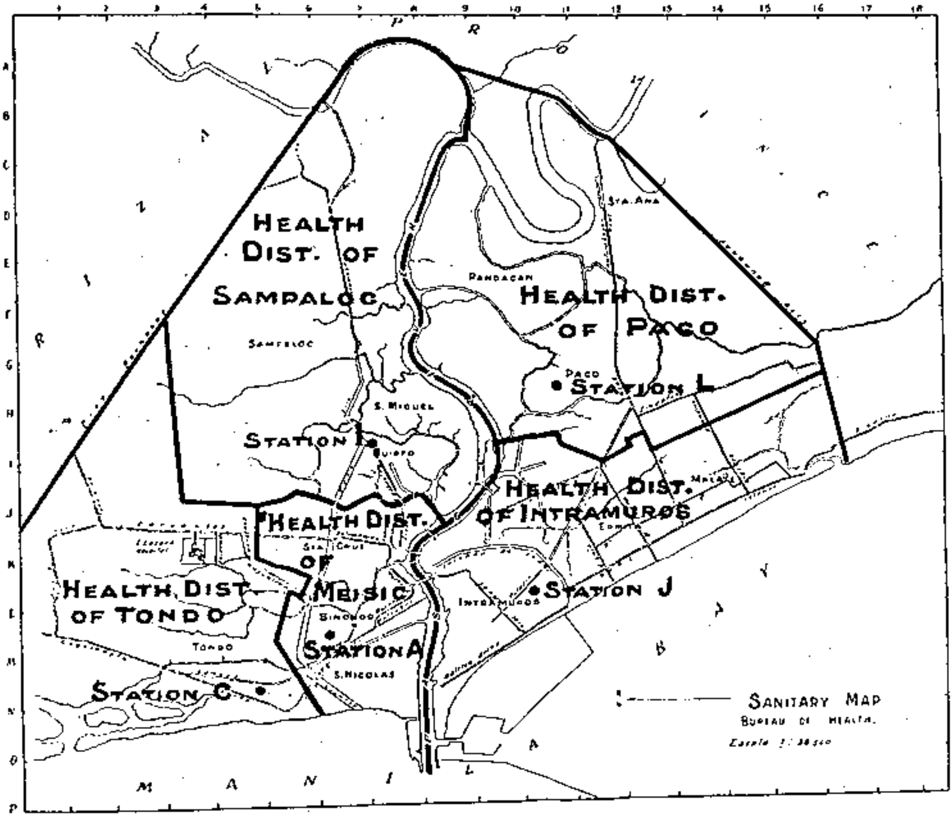

Health Dist. of Sampaloc
Health Dist. of Paco
Health Dist. of Intramuros
Health Dist. of Meisic
Health Dist of Tondo
Station L
Station I
Station J
Station A
Station C
Sampaloc
Pandacan
Sta. Ana
Paco
S. Miguel
Quiapo
Sta. Cruz
Binondo
Tondo
S. Nicolas
Intramuros
Ermita
Malate
Sanitary Map
Bureau of Health
M A N I L A

Chart I.

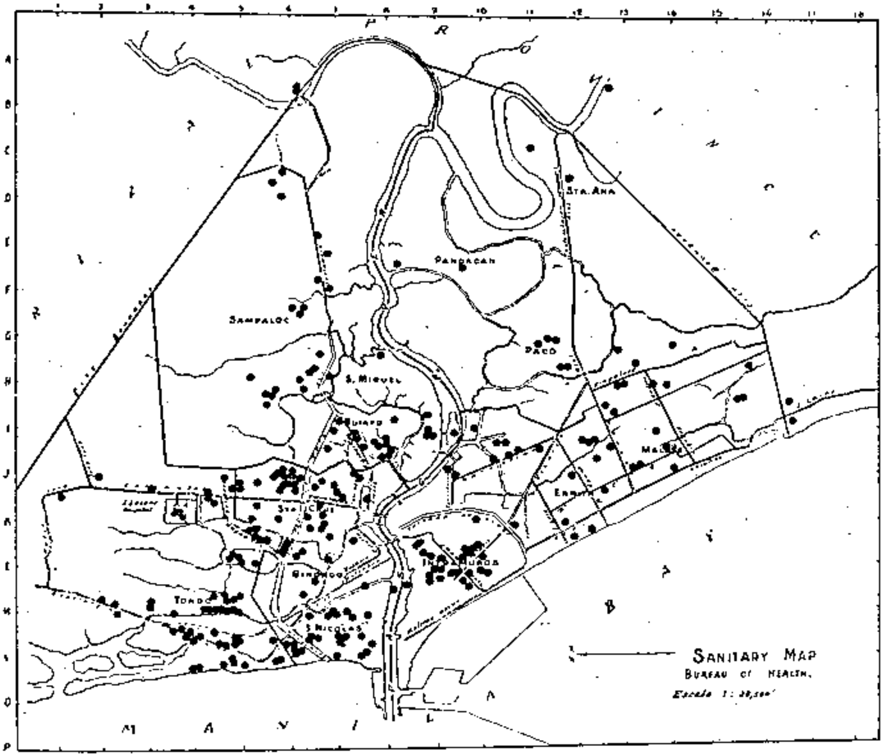


CHART SHOWING INFECTED HOUSES FOR 5 DAYS ENDED SEPT 23, 1908.

CHART 2.

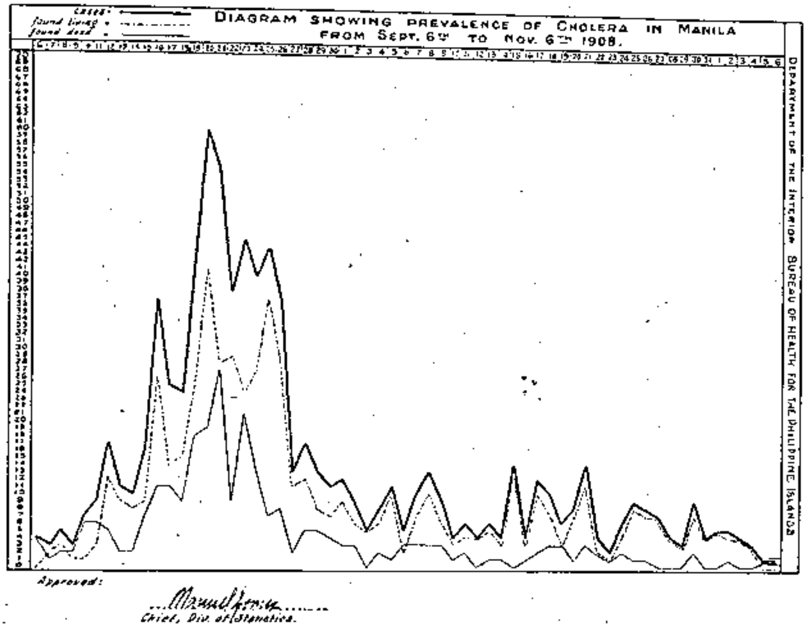


CHART 3.

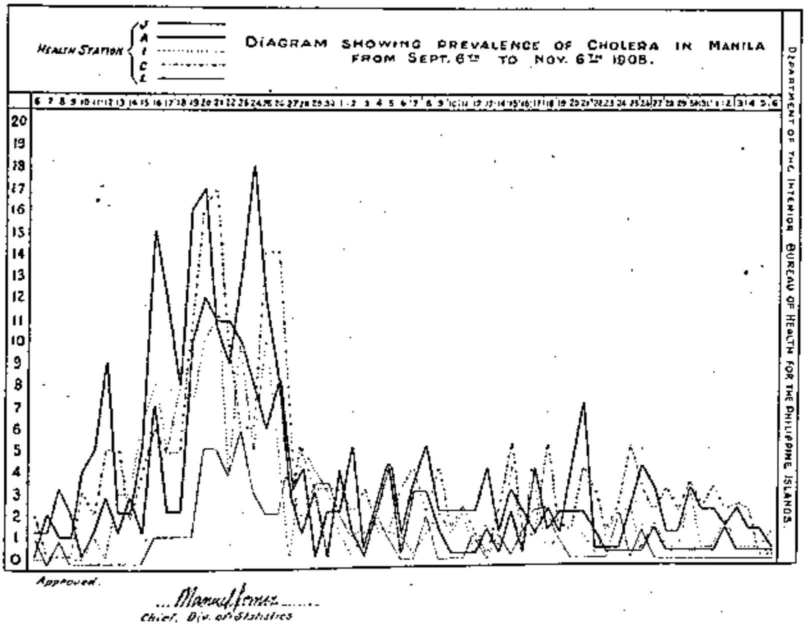
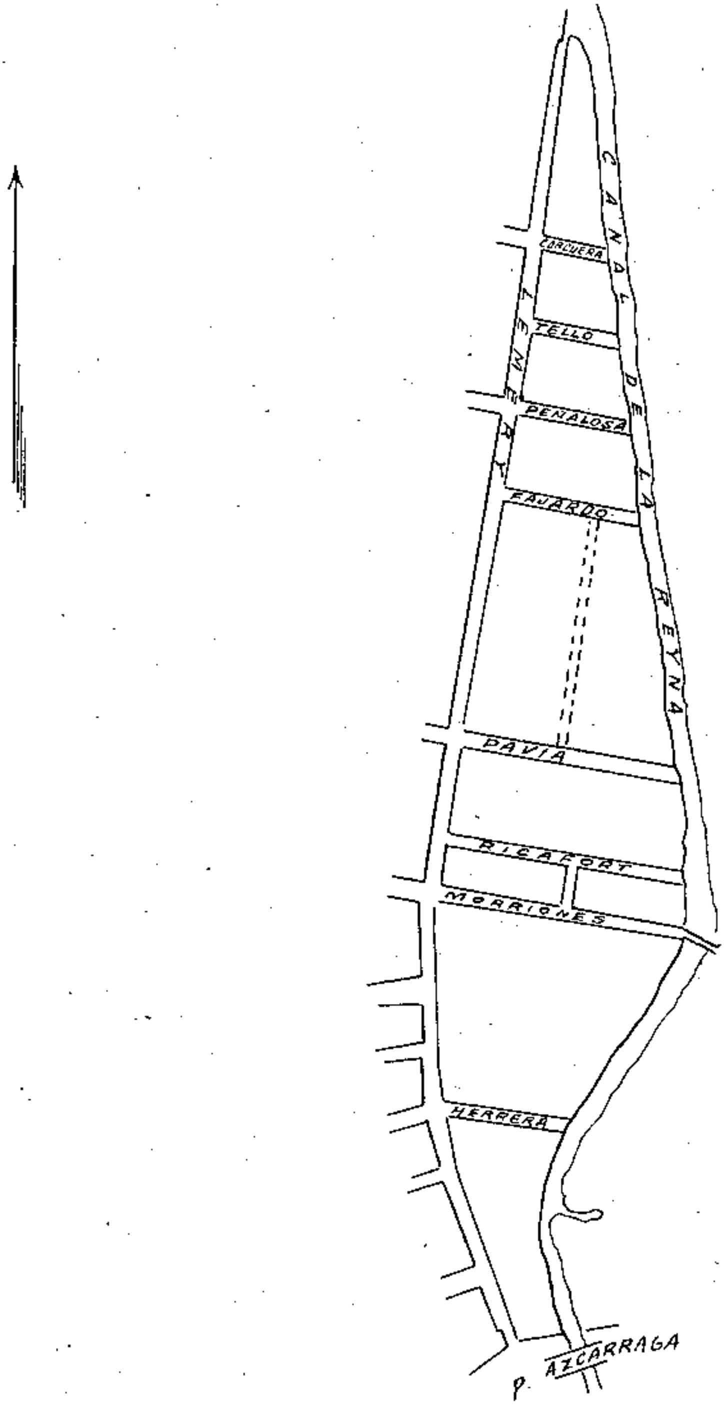
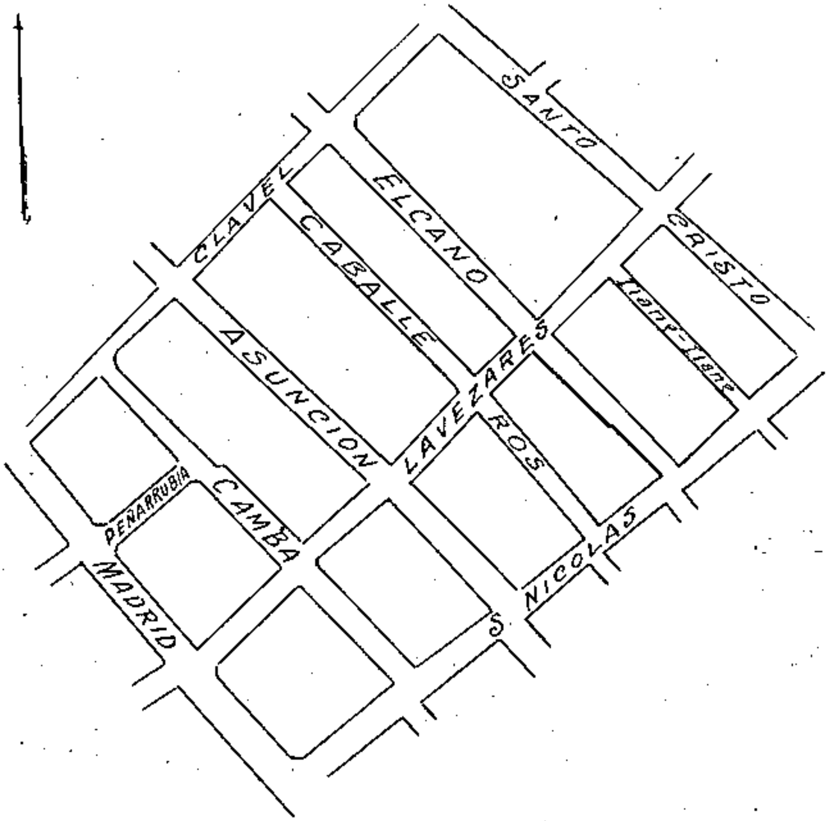


CHART 4.


CANAL DE LA REYNA
LEMERY
CORCUERA
TELLO
PENALOSA
FAJARDO
PAVIA
RICAFORT
MORRIONES
HERRERA
P. AZCARRAGA

Map 1.


SANTO
CRISTO
ELCANO
CLAVEL
CABALLE
ASUNCION
LAVEZARES
Ilang-Ilang
ROS
PEÑARRUBIA
CAMBA
MADRID
S NICOLAS

Map 2.

EDITORIAL.

DISCUSSION OF DR. McLAUGHLIN'S PAPER ON "THE SUPPRESSION OF A CHOLERA EPIDEMIC IN MANILA."[1]

Dr. N. M. Saleeby, superintendent of the University Hospital, Manila: I would like to ask Doctor McLaughlin for his opinion as to whether or not at the time of this outbreak cholera was endemic in Manila, or if it was brought from the provinces? Did the first case come from Pangasinan? I believe it to be of the greatest importance to Manila at the present time, for the Manila Medical Society at least to express an opinion. Did this present epidemic of cholera come from the provinces or from endemic cases in Manila? I would like to hear some discussion on this point.

Dr. Allan J. McLaughlin, Acting Director of the Bureau of Health for the Philippine Islands: Doctor Saleeby's question is a very difficult one to answer and it will require a great deal of study. I am not prepared to answer it at the present time. If the suspicious cases during January were connected with the epidemic of September it was not necessary to have it brought down the railroad. There was undoubtedly much reënforcement from neighboring provinces, cases being brought in repeatedly, but whether or not this explains all the cases it is difficult to say. We were unable to trace the first cases in July to the provinces.

In reply to the question as to the condition of the provinces now, Pangasinan, Tarlac, and Pampanga are clean; Bulacan shows from one to four cases per day in the whole province; in Rizal cases occur every few days, and there are very few cases in Cavite. There is not much cholera at the present time excepting around Manila.

Colonel Van R. Hoff, chief surgeon of the Division of the Philippines, United States Army: I would like to ask Doctor McLaughlin how many of the cases, reported as suspicious, turn out actually to be cases of cholera? The reason the question comes to my mind is (in studying as I do the daily reports of the Bureau of Health) that you have reported so many cases of suspected cholera. If any cases are reported as suspected cholera and later prove to be actual cases, how are they included in the report?

Doctor McLaughlin: We have no exact figures on that point, but I remember six cases in one day that were reported as suspicious and all six were later discharged as not cholera. I think the majority turn out not to be cholera, but I have no complete statistics. Cases which are reported as suspicious and later prove to be cholera are included in the report as cholera cases, and those in which the diagnosis eventually is negative are reported as not cholera.

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[1] Held at the meeting of the Manila Medical Society, October 19, 1908.

Dr. Richard P. Strong, chief of the Biological Laboratory, Bureau of Science; professor of tropical medicine, Philippine Medical School: A great deal has been said before the society about the examination of suspected cases of cholera which have occurred before the beginning of the actual epidemics in Manila and in which the bacteriologic examination for cholera has been negative. I think we have lost sight of the fact that we have in Manila an endemic disease known as cholera nostras. I have observed cases of this disease with more or less frequency in the Islands for the past ten years. There have been one or two outbreaks of this malady in the Army and cases are met with from time to time in the natives every year. This disease is well known in other portions of the world, for example in Europe and the United States. It obviously has nothing to do with Asiatic cholera, although its symptoms may sometimes closely resemble those of true cholera. I performed autopsies on a number of cases of cholera nostras in 1900 in Manila, when Doctors Flexner and Barker of the Johns Hopkins University were out here. At that time we searched very carefully for Asiatic cholera, but we never found cases of this disease. Some of the patients died at the old First Reserve Hospital and were carefully examined bacteriologically. From the intestines of some of these proteus bacilli were isolated. I think the cases that the Bureau of Health reports as suspected cholera from time to time, when Asiatic cholera is not present in Manila, are frequently those of cholera nostras or of ptomaine poisoning. Obviously, in these instances we can not find the organism of Asiatic cholera, it is not present, and the disease has an entirely different etiology.

The successful bacteriological diagnosis of Asiatic cholera depends upon the number of cholera organisms in the stool at the time of the examination and the care with which the bacteriological examination is performed. Occasionally, after a patient has been in the hospital for from forty-eight to seventy-two hours it may be impossible to make a bacteriologic diagnosis of cholera from the examination of the dejecta, for the reason that such patients may have been sick for several days before they entered the hospital and the cholera organisms frequently disappear almost entirely from the stool by the fifth or sixth day from the onset of the disease. If the case has succumbed to some late complication of the disease, or the autopsy was not performed until forty-eight hours or a few days after death, it may also be impossible to make a bacteriologic diagnosis of cholera. However, all this has nothing to do with the diagnosis during the acute symptoms of the disease, nor does it depend upon a change of morphology in the organism, or upon a change in its serum reactions, or upon the changes it produces in culture media; it simply depends upon the fact that the cholera organism is either not present or no longer present in sufficient numbers for us to be able to find it. I think it is a reflection upon the bacteriologist to say that he is not able to make a bacteriologic diagnosis of a case of cholera in which the examination is made within a short period of time after the onset of the symptoms. The methods employed in the laboratory are very satisfactory and definite for the bacteriologic diagnosis of cholera. We do not rely alone on the morphology of the organism, for its identification, as one might suppose from some of the remarks that have been made here, but we consider in addition its agglutinative and bacteriolytic reactions and to a certain extent its general biologic properties in culture media and its pathogenic properties. By all these means taken together we are able to make just as definite a bacteriologic diagnosis of Asiatic cholera as we are of typhoid fever or plague. During the past year Dr. Marshall has tried in the laboratory with definite strains of the cholera spirillum to produce a change in the organisms so that they would not agglutinate with a cholera serum, but he has not succeeded in accomplishing this, nor has anyone else done so. The fact that one or two atypical organisms ("El Tor" strains) which resemble the true cholera spirillum in all respects except in the production of hæmatoxins and which give the characteristic serum reactions with cholera serum, have been reported, does not serve to interfere with the bacteriologic diagnosis of cholera from a *practical standpoint*. I feel that we may have great confidence in being able to make bacteriologic diagnoses, providing the cases are seen early enough in the disease and that the examination is performed with sufficient care. A good deal has been said here about the cholera organism changing its morphology, biological properties, and serum reactions so that we were not able to recognize it in the laboratory, but I feel confident that we are still able to diagnose the cholera organism without difficulty for all *practical purposes.*

Dr. Van R. Hoff: I understand that you mean unless you do find the organism it is not cholera?

Dr. R. P. Strong: I do not mean that it is always not cholera if we do not find the organism in a specimen which had not been sent us until say forty-eight or seventy-two hours after the subsidence of all symptoms of the disease, or if the specimen is not delivered to us for several days, or if the autopsy is not performed until several days after death, or if the case has died of some late complication of cholera; but if we get the specimen in time we can find the organism if it is there. The idea has been expressed that before the actual epidemic or toward its close, the organism changes its morphology and its biologic properties to such a degree that we are not able to make a definite, bacteriologic diagnosis. There is no evidence whatever to support this theory, so far it is entirely theoretical.

Dr. Van R. Hoff: I think I heard a gentleman say the other day that the epidemic was losing its virulence as the vibrio was taking atypical forms?

Dr. R. P. Strong: Avirulent strains of the cholera organism sometimes undergo a change in morphology in laboratory artificial media. The spirillum isolated by Pfeiffer in 1894 which has been grown in various laboratories for about 14 years, usually no longer shows the typical comma form, but after frequent passages of this strain through guinea pigs its morphology becomes more typical of cholera. This organism, however, gives the typical serum reactions with cholera serum. By morphology alone, as I have stated, we do not attempt to identify an organism. We would not attempt to identify the plague or the typhoid fever bacillus by its morphology alone. It is by the combination of all the reactions that we identify bacteria and particularly by the serum reactions which are most specific of all.

Dean C. Worcester, Secretary of the Interior of the Philippine Commission, Manila: You have spoken of the disease known as cholera nostras. What is this disease caused by?

Dr. R. P. Strong: Many observers believe that the etiology of the disease is still obscure. Some cases have been thought to be due to meat poisoning, to septicine poisoning, or to intestinal infections with certain of the proteus bacilli or with Bacillus Botulinus. In 1900, when Doctors Flexner and Barker were in Manila, several cases died from this disease and were autopsied in the Army morgue. From these after a careful study a strain of the proteus bacillus was isolated. I also remember one epidemic in which 10 or 15 soldiers were attacked on the same day with symptoms of cholera nostras. The symptoms were supposed to have been caused from eating some spoiled hash served at the mess hall. No cholera spirilla were found in the stools of these cases. These attacks obviously had nothing to do with Asiatic cholera.

Dr. Van R. Hoff: Referring to the distribution of cholera in the city, there seem to be so many foci and it is widespread. Doctor McLaughlin, how do you account for that? You have a simultaneous outbreak in Malate, Intramuros, and Tondo, all separated and in various parts of the city. Could you trace any relationship between any of these different outbreaks?

Dr. Allan J. McLaughlin: No; no connection can be traced. The most plausible explanation is the bacilli carrier. Many of these infections are most puzzling. One case appears in Tondo, and another in Paco, and the case in Paco has no connection whatever which can be traced to Tondo.

Dr. R. P. Strong: I would like to ask Doctor McLaughlin if Doctor Gilman has not reported cases of cholera to the Bureau of Health ever since last January?

Dr. Allan J. McLaughlin: Yes; I think he has. The list I presented here shows practically all the cholera cases, and the only month without cholera was April, and in April we had many of the suspicious cases.

Dr. R. P. Strong: That shows that there was no difficulty in making a bacteriologic diagnosis of the cases as far back as January; that is, at a time before the disease became epidemic.

Dr. Allan J. McLaughlin: There was no cholera present at times, yet the surprising fact is that cases which resemble cholera clinically, but in which we did not find cholera vibrios occurred. Koch says this failure to identify the infecting agent is due to faulty technique, but I do not think so.

Dr. R. P. Strong: I do not think there was any mistake in the diagnosis of the cases. The bacteriologic diagnosis of cholera is a very definite one. A great deal depends, however, on the technique and the care with which the examination is made.

Dr. Van R. Hoff: You were not here, Doctor Strong, but last year (1907) we had a little epidemic of cholera beginning about July and running up to the latter part of December and January, and then it subsided. During the first six months of 1908 we had practically no cholera, excepting occasional, sporadic cases, and then about the same time this year as last, the cases increased in number until they culminated the other day. Why that should be, I do not know, but there may be some relation in it. In studying the history of the Philippines, the epidemics seem always to come about this time, and they cover a period of three or four months in their intensity. Looking back and considering the epidemics for the entire Archipelago and particularly the Island of Luzon, the following appears to be true, when the epidemic last year ceased in Manila it seemed to begin in Dagupan. The first report of any large number of cases I believe came from Dagupan, and the infection worked its way through Pangasinan and appeared in Manila. There were apparently no cases between Manila and Dagupan, at least according to the reports I saw. Cholera jumped from here to Dagupan, and from Dagupan back. All over the Archipelago and in various points in Mindanao we have had cholera, a little here and a little there, but in no great amount, until it developed in Pangasinan. I presume up to the present time, in round numbers, we have twenty-five or twenty-six thousand cases with about fifteen thousand deaths.

Dr. Allan J. McLaughlin: There were something over twenty thousand cases.

Dean C. Worcester: Were Doctor Gilman's diagnoses of cholera all confirmed?

Dr. R. P. Strong: I know some certainly were, after I returned. I came back in April. Doctor Gilman told me he had reported cholera cases in January, before I got back.

Dean C. Worcester: I remember Doctor Heiser complained that Doctor Gilman's diagnoses were not confirmed.

Dr. R. P. Strong: I think Doctor Gilman told me some of the cases which came to the morgue were not cholera. Of the cases of cholera I know that some were identified bacteriologically.

Dr. Paul C. Freer, Director of the Bureau of Science; dean of the Philippine Medical School: All were confirmed after Doctor Heiser mentioned the matter. I have been surprised at the great number of bacilli carriers discovered this year. Over a year ago the Bureau of Science asked the Bureau of Health to send cholera stools of contacts from all stations. We started the work on January 22, 1908 but somehow we failed to get a very large number of stools. We found two Japanese carriers and then we obtained no more material until lately during this epidemic, and these examinations gave us a total of about 7 per cent. This number seems to me usually high. I wish to ask Doctor Strong what the percentage was in the El Tor epidemic.

There is another question that has not been discussed this evening, namely that of vaccination against cholera. What have the other nations that have had to deal with cholera done in this respect? We have done nothing this year, but I think vaccination is being employed in Europe.

I was very much interested in Doctor McLaughlin's statements regarding the nipa houses and the general sanitation of the city. I recall the history of a few years ago, during the early days of the Board of Health, when strenuous efforts were made to clean up various districts of the city. A great many houses had their foundations changed and their ground floors raised above the street levels. Several old and insanitary markets were destroyed, others rebuilt and many insanitary houses burned. An ordinance was passed giving a minimum of 3 meters' distance between nipa houses and insuring a certain height of the ground floor above the street. Public latrines were put in as far as possible. The continuation of these improvements was side-tracked, because of the lack of adequate authority to back up the work of the Board of Health. One example of radical improvement was the remodelling of Calle Carvajal. The discussion leading up to this improvement lasted over four months, but finally the owners of the property were persuaded to do the right thing. Much controversy took place as to the best sanitary code that could be produced, and finally we have a sanitary code combined with the building ordinance, so that in the future the Bureau of Health is in shape to accomplish results by ordinance where the former Board of Health had had to do everything by persuasion, excepting where houses were destroyed by burning. As soon as the pressure of an epidemic disappeared, the capability and power of the old Board of Health to do things was limited by the available ordinances.

Dr. R. P. Strong: In regard to bacilli carriers, that is individuals who carry cholera spirilla in their stools and apparently have no symptoms of disease, it is well recognized that cholera may be spread by such persons, although the organisms do not remain for long periods of time in their intestines. It has been suggested that it was by the means of such carriers that cholera was introduced from St. Petersburg into Berlin. In the epidemic of Hamburg many healthy individuals were found to harbor bacilli. I can not give all the figures, but I remember that the examination of 60 cases, revealed 19 who had cholera organisms in their stools, and none of these had practically any symptoms of cholera. This year, in Japan, 2 per cent of the individuals examined coming into contact with cholera cases were found to carry cholera organisms in their stools. Von Esmarch found that 12 out of 35 healthy cholera contacts examined, contained cholera spirilla in their dejecta. In Manila during the present year we have already found 27 healthy individuals (cholera contacts) from whom cholera spirilla have been isolated.

You ask what is being done in regard to vaccination against cholera in other countries. I can only say that vaccination is pursued extensively in India, where the owners of some large tea plantations no longer employ coolies unless they are vaccinated. At the International Hygienic Congress held last year in Berlin Zabolotoy reported the successful results obtained in Russia. The government of Egypt was also preparing to use protective vaccination against cholera when I was there in January. Inoculations here in the Islands for cholera have not been very extensive. They show that in the vaccinated the percentage that contracted the disease was only one-sixth of that which contracted it in the nonvaccinated.

Dean C. Worcester: I am sorry to disagree with Doctor Freer in one particular. He has overlooked the fact that although we had passed a good sanitary code, the Municipal Board has done some repealing of ordinances. The proper laws were prepared and, with the approval of the Secretary of the Interior, became law. They were enacted in an entirely satisfactory manner, but taking advantage of the fact that its action was not subject to any control by the Bureau of Health or the Governor-General, the Municipal Board has repealed some of the most important sections. It has, furthermore, encouraged constant violations of the provisions of the building ordinance, going on the assumption that it had no proof that the buildings to be erected were going to be used for purposes other than the ones designated by the owners, until they had been so used. In other words, the attitude of the Municipal Board has been that of the policeman who saw a murdered man and another man with a double-barrel shotgun near him, but assumed that he could not arrest the latter because he had not seen him use the gun. We have many houses unfit for human habitation, and as long as the Municipal Board is obliged to accept the statements of the people as to how they will be used, this will continue.

I can state the following as to whether or not cholera is endemic in the Philippine Islands: It is shown very conclusively from the epidemic in 1905 in Manila that the Islands have never since been free from active infection,—we have always had cholera doing serious damage in some parts of the Islands. The investigations I made of the outbreaks during the Spanish days may be of interest.

In 1882, two hundred people died at Maybun on the Island of Sulu in forty days. From here the disease spread to Zamboanga and from Zamboanga to Manila on the *San Francisco Reyes*. We have positive proof that on one day thirteen hundred persons died in the city of Manila. Then came a typhoon and, as the disease had begun to fall off at that time, the Governor-General thought it about time the cholera should terminate and so he proclaimed the cholera at an end, and so ended the outbreak. After this time there were some cases resembling cholera, but the Governor-General gave another name to the infection. Cholera continued during 1882 and 1885. In 1885 they were receiving four, five, and six cases a day in San Juan de Dios Hospital. We can draw some conclusion as to the number of cases when that number presented itself voluntarily at one of the hospitals. In 1884, in accordance with the directions of the Governor-General, these infections were referred to as something else. In the beginning of 1888 cholera became so bad that it could not be concealed, and the condition developed so that it was impossible to cover up the fact of the existence of the disease. The leading physicians of the city met the Governor-General and informed him of the facts. They told the Governor-General what the condition was and that it could not be further disguised. It was necessary for the benefit of the public that the fact be no longer concealed and the Governor-General suggested three names by which it might be called. A short time afterwards, when the Governor-General had a falling-out with the chief health officer, it suited his pleasure to discredit his statements, and so the actual facts became known.

Dr. Van R. Hoff: I ask, how can we hope to get rid of cholera in the future? Of course, that is the essential part of the discussion. Doctor McLaughlin made some admirable suggestions—can they be carried out? What machinery of government is available or can be made available by means of which we can eliminate the disease that has existed from the time that man remembers not to the contrary? The Army is under obligation to do what it can.

Dr. Philip E. Garrison, United States Navy, medical zoölogist, Biological Laboratory, Bureau of Science, and associate professor of medical zoölogy, Philippine Medical School: I think Colonel Hoff's question gives me the opportunity I have been waiting for. Last February at the annual meeting of the Philippine Islands Medical Association a resolution was presented to the government for a commission to investigate the methods for properly disposing of human excreta in the Philippine Islands. Animal parasites at that time seemed to have the center of the stage, and the resolution was made in order to improve the conditions in regard to animal parasites and amœbæ. Animal parasites have given way to cholera and in consultation with Doctor Nichols and others, another resolution has been prepared, which is presented without comment to the society.

Whereas it would appear that the greatest single sanitary need of the Philippine Islands is the proper disposal of human excreta; and

Whereas the proper disposal of human excreta is the one measure preëminently demanded for the control and suppression of certain prevailing diseases, notably cholera, dysentery, typhoid fever, and infections with intestinal worms, without which, provision of other sanitary measures must prove ineffectual; and

Whereas the problem of providing satisfactory, efficient and sanitary means of disposing of human excreta throughout these Islands is so large and complex as to require special and perhaps experimental study by competent men who can give undivided attention to its solution: Therefore be it

Resolved, That the Manila Medical Society does petition the Government of the Philippine Islands, through the honorable the Secretary of the Interior, that a commission of five properly qualified persons be appointed to investigate and decide upon the best method or methods for disposing of human excreta that can be established in these Islands, and that such appropriation be made and such means provided for the establishment of the working system for the disposal of human excreta as from the report of this commission may appear practical and expedient.

It is further recommended that the Director of Science and the Director of Health be *ex officio* members of this commission.

Dr. H. J. Nichols, United States Army, member of the Board for the study of Tropical Diseases as they exist in the Philippines: I second the motion. At the annual meeting of the Philippine Islands Medical Association, there was considerable discussion on this matter, and Sir Allan Perry from Ceylon said that we were trying to do too much, that we ought to be satisfied as other people are and that such investigations are not practicable. Well, we have not tried it for one thing, and for another, the United States sanitary and medical service accomplished results in Panama and Porto Rico which on their face appeared to be impracticable and impossible. I am very strongly in favor at least of this resolution being tried. I believe it is the most important measure to be taken up really to get at the root of all these diseases with which the Filipinos are afflicted. The digging of artesian wells and similar measures are proper, but they do not strike at the bottom of the trouble. If we could dispose of the fæces of the sick it would prevent other people from becoming infected, and until we do this it will require a system of education which is certainly one or two generations ahead. This measure could be put into effect without any consciousness on the part of the Filipinos, that is, without conscious effort. It is practicable to be put in operation and would be a daily routine. I, therefore, second this measure and hope it will be passed.

On being put to the vote the motion was unanimously adopted.

BOOK REVIEWS.

Treatise on Diseases of the Skin. For the use of Advanced Students and Practitioners. By Henry W. Stelwagon, M. D., Ph. D. Fifth Edition. Thoroughly Revised. With 267 illustrations in the text and 34 full-page colored and half-tone plates. Cloth. Pp. 1150. Price $6. Philadelphia and London. W. B. Saunders Company, 1907.

In this last revision, the articles on skin diseases of tropical distribution have been largely rewritten, and several affections of this class, have been introduced for the first time. A new chapter on Dhobie-itch, calling attention to the varied affections grouped together under this name, shows a good understanding of these tropical skin lesions, and their etiology. The article on uncinarial dermatitis, also new, is not so satisfactory and will not be of much value in assisting practitioners to recognize this malady which is said to be very common in tropical countries, but which is certainly not frequently recognized in the Philippines where hookworm disease is rife. The chapter on frambœsia is especially well presented, but could be improved by a description of the methods of finding the *Treponema pertenuis* from the serum of the eruption, a very easy procedure. In discussing the relationship of *Treponema* to yaws and syphilis, and of the Donovan-Leishman body to Oriental sore, the author has, it is thought, been over conservative in view of the large amount of evidence which has been brought forward in support of their causal relationship. Upon the whole, this work, reviewed from the standpoint of the tropical practitioner, is excellent, both as to illustrations and reading matter. The space devoted to treatment is large and the therapeutic agents recommended are, in the opinion of the reviewer, well selected.

A feature of the book, which will appeal to many is the abundant references to the recent literature which accompany each subject.

J. M. P.

Essential of Sanitary Science. By Gilbert E. Brooke. Cloth. Pp. xii+413. Price, 6s net. London: Henry Kimpton, 1909.

This manual is one of Kimpton's Essential Series and is designed for students preparing for the D. P. H. examination, being based on the author's own notes in his reading and laboratory courses for that degree at Edinburgh, and is invaluable to those for whom it is intended and useful to every one who desires to know what is being taught along the lines of sanitary science in the leading universities of the British empire.

The book consists of 413 pages, 387 of which are divided into 20 chapters, treating respectively of Hydrostatics, Pneumatics, Heat, Meteorology, Air, Water, Water Analysis, Food, Food Analysis, Disinfection and Disinfectants, Bacteriology, Parasitology, Personal and School Hygiene, Geology, Sanitary Architecture and Engineering, Disposal of Waste Products, Epidemiology and Endemiology, Vital Statistics, Sanitary Law and Sanitary Administration. The remaining pages are devoted to an appendix of general information of interest to students in the D. P. H. course.

The printing, binding, and arrangement of the volume fully sustain the high reputation of the publishers.

A. J. McL.

PREVIOUS PUBLICATIONS—Continued.

ORDER No.

Bureau of Science—Annual Reports.

201. Fifth Annual Report of the Director of the Bureau of Science for the Year Ending August 1, 1906.
202. Sixth Annual Report of the Director of the Bureau of Science for the Year Ending August 1, 1907.
203. Seventh Annual Report of the Director of the Bureau of Science for the Year Ending August 1, 1908.

Philippine Museum.

(Now Section of Ornithology.)

* *No. 1, 1903.*—On Birds from Luzon, Mindoro, Masbate, Ticao, Cuyo, Culion, Cagayan Sulu and Palawan. By Richard C. McGregor.
* *No. 2, 1903.*—List of Bird Skins Offered in Exchange.
43. *No. 3, 1904.*—Birds from Benguet Province, Luzon, and from the Islands of Lubang, Mindoro, Cuyo, and Cagayancillo. By Richard C. McGregor.
* *No. 4, 1904.*—The Birds of Calayan and Fuga, Babuyan Group. By Richard C. McGregor.

Mining Bureau.

(Now Division of Mines.)

45. *1890.*—Descripción física, geológica y minera en bosquejo de la Isla de Panay por D. Enrique Abella y Casariego, Inspector General de Minas del Archipiélago.
* *1890.*—Memoria descriptiva de los manantiales minero-medicinales de la Isla de Luzón, estudiados por la comisión compuesta de los Señores D. José Centeno, Ingeniero de Minas y Vocal Presidente, D. Anacleto del Rosario y Sales, Vocal Farmacéutico, y D. José de Vera y Gómez, Vocal Médico.
47. *1893.*—Estudio descriptivo de algunos manantiales minerales de Filipinas ejecutado por la comisión formada por D. Enrique Abella y Casariego, Inspector General de Minas, D. José de Vera y Gómez, Médico, y D. Anacleto del Rosario y Sales, Farmacéutico; precedido de un prólogo escrito por el Excmo. Sr. D. Angel de Avilés, Director General de Administración Civil.
48. *1893.*—Terremotos experimentados en la Isla de Luzón durante los meses de Marzo y Abril de 1892, especialmente desastrosos en Pangasinán, Unión y Benguet. Estudio ejecutado por D. Enrique Abella y Casariego, Inspector General de Minas del Archipiélago.
49. *1901.*—The Coal Measures of the Philippines. Charles H. Burritt.
50. *1902.*—Abstract of the Mining Laws (in force in the Philippines, 1902). Charles H. Burritt.
51. *1902., Bulletin No. 1.*—Platinum and Associated Rare Metals in Placer Formations, H. D. McCaskey, B. S.
52. *1903.*—Report of the Chief of the Mining Bureau of the Philippine Islands. Charles H. Burritt.
53. *1903, Bulletin No. 2.*—Complete List of Spanish Mining Claims Recorded in the Mining Bureau. Charles H. Burritt.
54. *1903, Bulletin No. 3.*—Report on a Geological Reconnoissance of the Iron Region of Angat, Bulacan. H. D. McCaskey, B. S.
55. *1904.*—Fifth Annual Report of the Mining Bureau. H. D. McCaskey.
56. *1905.*—Sixth Annual Report of the Chief of the Mining Bureau. H. D. McCaskey.
57. *1905, Bulletin No. 4.*—A Preliminary Reconnoissance of the Mancayan-Suyoc Mineral Region, Lepanto, P. I. A. J. Eveland, Geologist.
58. *1905, Bulletin No. 5.*—The Coal Deposits of Batan Island. Warren D. Smith, B. S., M. A., Geologist.

Division of Mines.

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CONTENTS.

Page.

VASSAL, J. J. Atoxyl in the Treatment of Malaria 1

BEAN, ROBERT BENNET. Methods of Studying the Structure of the Central Nervous System 9

VASSAL, J. J., AND BROCHET, A. Dengue in Indo-China. Epidemic on Board the "Manche" 21

RUEDIGER, E. H. Filtration Experiments on the Virus of Cattle Plague with Chamberland Filters "F" 37

McLAUGHLIN, ALLAN. The Suppression of a Cholera Epidemic in Manila 43

EDITORIAL 59

REVIEWS 69

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